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ABSTRACT

This report examines the environmental training efforts of community colleges in Illinois. The text includes a series of nine model environmental protection curricula and outlines appropriate course descriptions for pollution control and abatement, radiation, and general environmental technology. A final section offers recommendations which address existing and future environmental concerns and their relationship to higher education. (CS)

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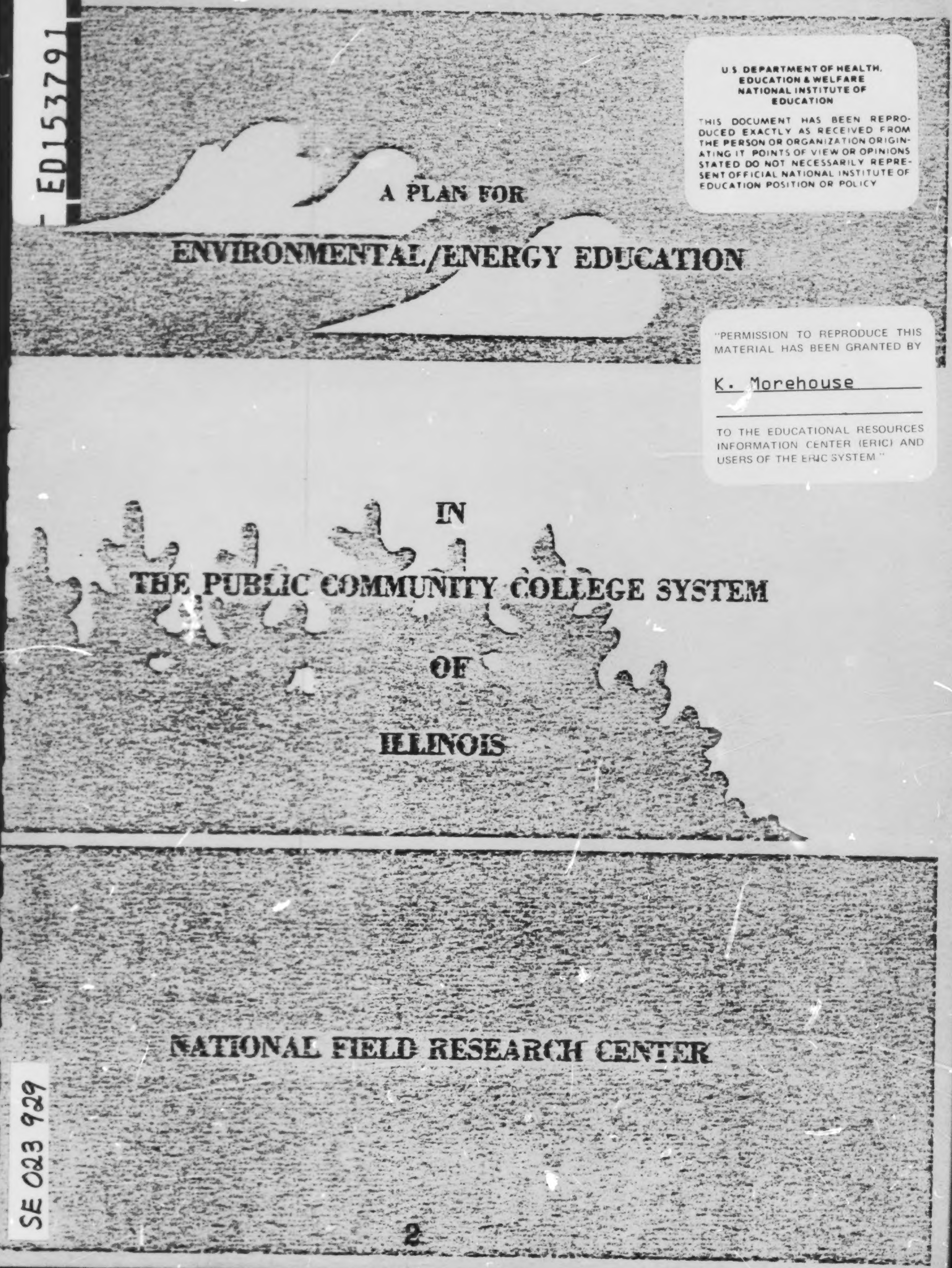

A PLAN FOR
ENVIRONMENTAL/ENERGY EDUCATION

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STATE OF ILLINOIS

ENVIRONMENTAL/ENERGY EDUCATION IN THE PUBLIC COMMUNITY COLLEGE SYSTEM

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1975

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Dr. Richard L. Benesh, Jr., Project Director
National Field Research Center, Inc.
Iowa City, Iowa, June, 1975

PREFACE

Development of the Community College aspect of the Illinois Master Plan for Environmental/Energy Higher Education was undertaken in June of 1974. The first two parts of this study included a manpower survey and employment projections (to 1980) in six separately published booklets for the pollution control and abatement areas of air, noise, pesticides, public water, solid waste and waste water. This series also included a booklet summarizing the information of all six booklets and is appended to this report.

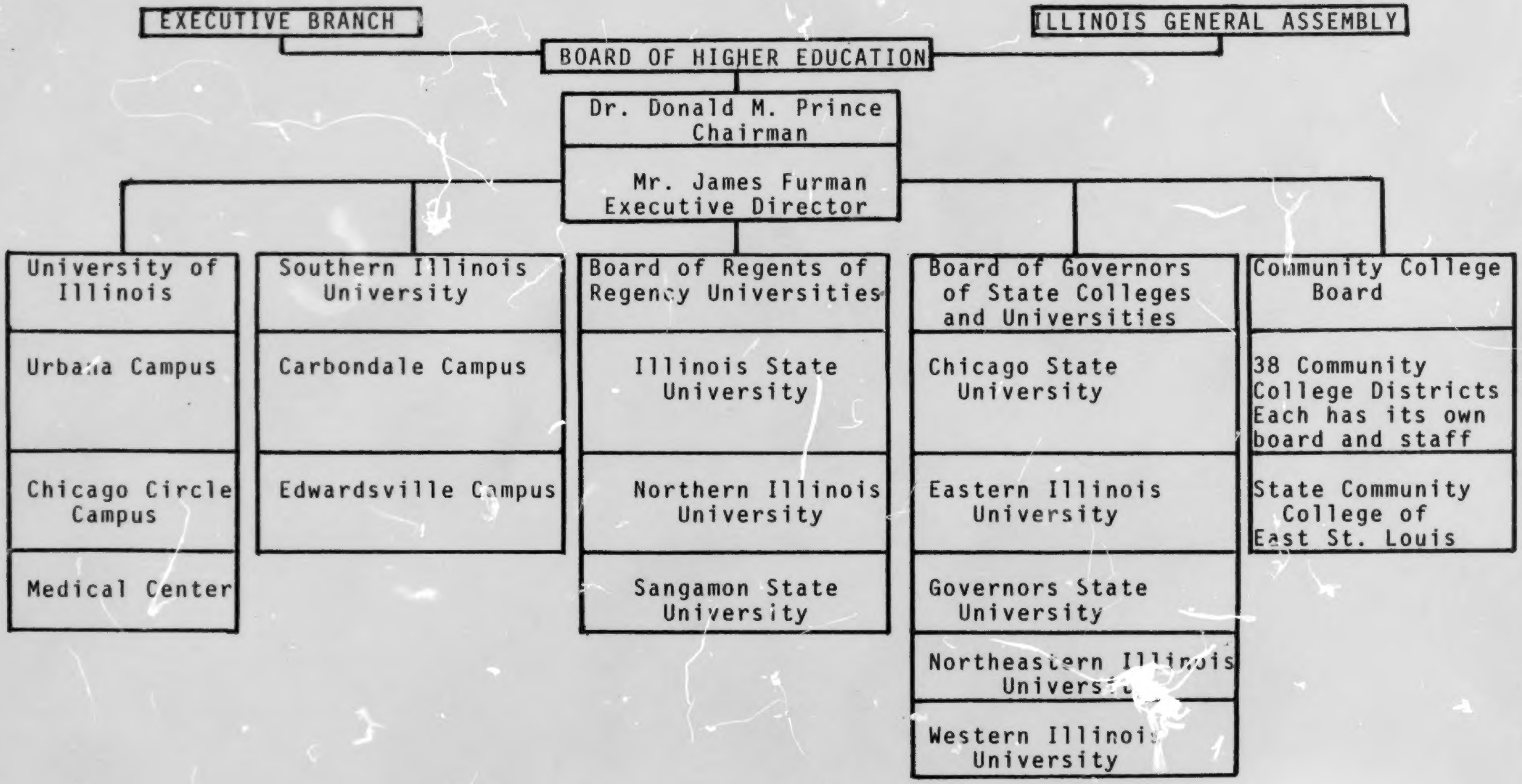
The third and final part of the report examines present environmental training efforts by Illinois Community Colleges, presents a series of nine model environmental protection curricula, outlines appropriate course descriptions for the aforementioned pollution control and abatement fields and adds the fields of general environmental technology and radiation. A final section offers a number of recommendations to the Illinois Board of Higher Education. These recommendations address themselves to existing and future state environmental concerns and are conclusions drawn from data, information and opinion provided by community colleges, state education offices, industry and state and federal environmental protection agencies.

This study was carried out for the Illinois Board of Higher Education and the Illinois Institute for Environmental Quality with the cooperation of the United States Environmental Protection Agency by the National Field Research Center, Inc., Iowa City, Iowa.

FOREWORD

As in the first two parts of the study, part three utilizes data gathered from primary sources such as state, federal and local environmental protection agencies, public community colleges, municipalities and professionals working in the respective environmental protection fields. This study does employ limited telephone survey as a data gathering mechanism, as well as secondary source research, but in large part the data compiled in the study is a consequence of extensive personal interviews or on-site investigation carried out by the project staff. Finally, this study is designed specifically to be used as a reference tool for confronting future environmental pollution control and abatement training and employment needs in Illinois, but the methodologies and conclusions should have implications for the other states.

ORGANIZATIONAL STRUCTURE OF THE ILLINOIS BOARD OF PUBLIC HIGHER EDUCATION



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  - Governors State University
  - Northeastern Illinois University
  - Western Illinois University
- Community College Board
  - 38 Community College Districts Each has its own board and staff
  - State Community College of East St. Louis

The

Illinois Public Community College

System

THE ILLINOIS PUBLIC COMMUNITY COLLEGE SYSTEM

The Illinois Public Community Colleges are administered by the Illinois Board of Higher Education and are under the aegis of the Illinois Community College Board (ICCB). The ICCB was created in 1965 by an act of the Illinois General Assembly. Chief among its responsibilities are the coordination of the Illinois Public Community College System. Board activities under this mandate include: awarding diplomas and certificates, distribution of funds, program approval, development of policies and recognition of new local districts. At the local district level the colleges are governed primarily by a board of trustees.

At the time this study was conducted (1974-75) there were thirty-eight public community college districts encompassing forty-eight campuses in Illinois, with two other districts due to open in 1975 and 1976 respectively. Recent Illinois legislation (Senate Bill 1188, implemented 1974) placed about 98% of the state population within a community college district (see page 8). According to October 1974 figures, opening enrollment across the state was 267,000 students registered as either full or part-time participants in the instructional credit courses offered at the forty-eight community colleges. This figure represents nearly 115,000 full-time equivalent students (FTE). Further, more than 60,000 individuals are expected to take part in the various no-credit community education offerings, raising the total enrollment figure to more than 327,000 students.

As a complement to the regular courses offered to the full and part-time students (70% of all students are enrolled on a part-time basis), the colleges also conduct extensive evening and Saturday programs. Total evening and Saturday enrollment accounts for about 35% of all generated semester credit hours. The majority of students attend the community college in their home district; however, there are provisions (fee charge-back) for them to attend institutions other than their resident college to take part in programs not available to them.

Additionally, the Illinois Environmental Protection Agency (IEPA) carries out numerous evening and part-time training programs with cooperating community colleges for individuals either interested in or already working in various environmental pollution control and abatement fields. The most widespread and extensive of these programs appear to be for public and waste water treatment plant personnel seeking either entry or upgrade skills. The soon to be completed training facility at Southern Illinois University, Edwardsville campus, will be a significant factor in providing not only a modern training facility for public/waste water, but ought to be a valuable technical assistance resource for all water training activities in Illinois.

The Illinois System of Public Community Colleges has also set forth six statements of purpose which address themselves to the mission and scope of the comprehensive public community college. These statements are reprinted below (source: Illinois Community College Bulletin, October, 1974):

1. Provide the first two years of baccalaureate education consisting of liberal arts, sciences, and pre-professional fields designed to prepare students for transfer to four-year colleges and universities and/or designed to meet individual educational goals.

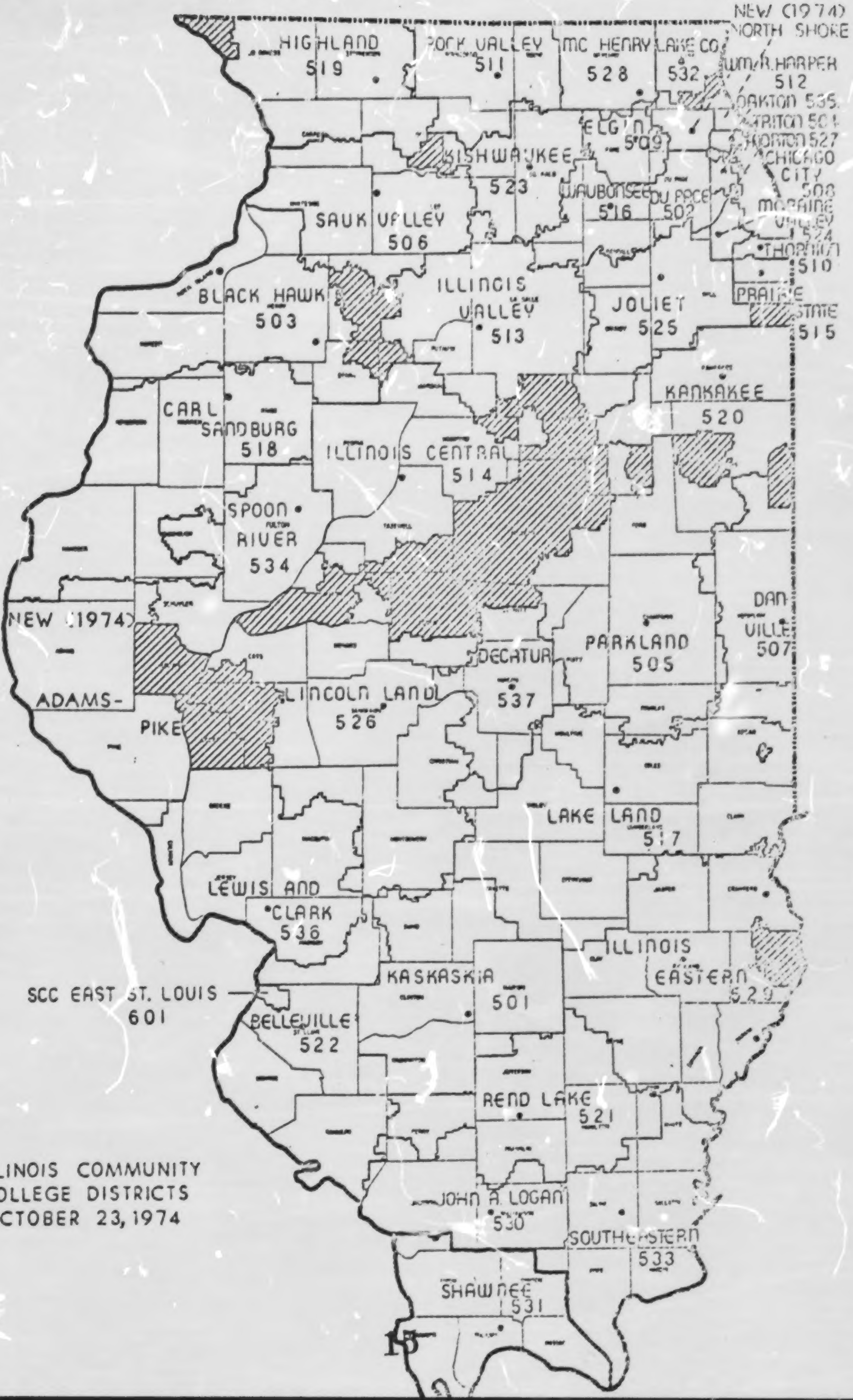
2. Provide career education including occupational, vocational, technical and semi-technical fields designed to provide job training, retraining, and/or upgrading of skills to meet individual, local and state manpower needs.

3. Provide general studies, including preparatory or developmental instruction, adult basic education, and general education designed to meet individual educational goals.

4. Provide community education, including non-credit adult continuing education classes, designed to meet individual educational goals.

5. Provide public service activities of an educational nature which may include workshops, seminars, forums, cultural enrichment, community surveys, facility usage and studies designed to meet community service needs.

6. Provide student services designed to reflect the programmatic development and direction of the institution, including, but not limited to, admissions, counseling, testing, tutoring, placement and special assistance for disadvantaged students.


NEW (1974) NORTH SHORE
HIGHLAND 519
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OAKTON 535
TRITON 504
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ILLINOIS COMMUNITY
COLLEGE DISTRICTS
OCTOBER 23, 1974

* OPENING FALL TERM 1974 STUDENTS ENROLLMENTS IN ILLINOIS PUBLIC COMMUNITY COLLEGES

(Counts based on end of registration or approximately the tenth instructional day of the fall term)

		HEADCOUNT		* * F. T. E.	
		Students Fall 1974	% Increase From Fall 1973	Students Fall 1974	% Increase From Fall 1973
501	Kaskaskia	2,239	37.4	1,263	6.2
502Q	DuPage	12,344	23.5	7,108	14.3
503	Black Hawk	(7,428)	(8.6)	(3,755)	(-1.1)
	Black Hawk Q.C.	6,596	5.6	3,289	-3.0
	Black Hawk East	832	41.0	466	12.0
504	Triton	19,799	19.1	8,173	21.0
505Q	Parkland	5,285	17.3	3,262	15.0
506	Sauk Valley	2,107	6.8	1,304	5.0
507	Danville	3,196	46.0	1,765	18.0
508	Chicago City	(86,773)	(26.9)	(34,292)	(17.7)
	Kennedy-King	9,507	14.4	5,985	9.6
	Loop	12,069	2.8	4,241	-11.5
	Malcolm X	4,663	6.9	3,179	9.6
	Mayfair	5,923	52.3	2,238	5.8
	Olive-Harvey	5,064	-1.5	3,104	2.0
	Southwest	6,904	38.4	3,058	13.1
	Wilbur-Wright	15,161	77.8	5,616	10.6
	Skills Center	27,482	28.4	6,871	129.0
509	Elgin	4,134	2.5	1,959	4.4
510	Thornton	6,723	44.4	3,302	8.0
511	Rock Valley	6,304	-.6	3,000	-2.7
512	Wm. R. Harper	10,713	21.5	5,772	8.0
513	Illinois Valley	2,997	6.9	1,922	8.2
514	Illinois Central	10,440	8.9	4,878	8.3
515	Prairie State	4,418	11.0	2,134	9.0
516	Waubonsee	5,193	9.1	2,143	10.2

517Q	Lake Land	3,180	9.0	2,173	2.0
518Q	Carl Sandburg	1,743	-4.9	944	-2.1
519	Highland	2,564	6.1	1,007	3.0
520	Kankakee	3,682	11.0	1,349	6.6
521	Rend Lake	1,317	3.0	922	2.0
522	Belleville	7,815	36.7	3,889	21.0
523	Kishwaukee	2,402	27.0	1,223	12.0
524	Moraine Valley	7,907	16.9	3,754	8.2
525	Joliet	6,835	14.3	3,295	3.9
526Q	Lincoln Land	4,914	3.0	2,616	-8.5
527	Morton	1,996	7.4	1,222	0
528	McHenry	2,288	7.0	908	4.0
529Q	IL Eastern	(5,262)	(13.6)	(2,678)	(12.1)
Q	Lincoln Trail	1,033	19.4	609	22.0
Q	Olney Central	2,640	5.1	1,230	5.1
Q	Wabash Valley	1,589	26.7	839	16.9
530Q	John A. Logan	2,999	16.0	1,311	-8.0
531Q	Shawnee	1,738	45.4	1,008	20.3
532	Lake Country	6,065	9.0	2,958	9.7
533	Southeastern	1,353	18.8	704	8.2
534	Spoon River	1,046	14.2	643	6.3
535	Oakton	4,344	17.0	2,430	8.4
536	Lewis & Clark	3,390	18.3	1,893	7.1
537	Decatur	1,925	24.0	1,034	14.9
	SUBTOTALS	164,858	19.2	123,993	10.6
601	SCC, E. St. Louis	2,491	-14.6	1,886	-7.5
	STATE TOTALS	267,349	18.8	125,879	10.4

* From the Illinois Community College Bulletin, November-December, 1974.

** F.T.E. - Full Time Enrollment.

ENVIRONMENTAL COURSE/PROGRAM OFFERINGS OF ILLINOIS PUBLIC COMMUNITY COLLEGES

The following listings demonstrate that all thirty-eight Illinois public community colleges currently offer course work or programs designed to meet environmental specialties, e.g., water/waste water technology, or a wide variety of options in electronics, agricultural areas, horticulture and mechanics which have implications for environmental fields. While a number of the courses are independent offerings available as electives or through the adult or continuing education system, nearly all colleges formalize their environmental curricula into associate degree or certificate programs. Certification in particular disciplines confirms practical proficiency, but these programs do not necessarily meet requirements for an associate degree, nor do they assure the graduate of certification by the agency employing the individual. The associate degree programs provide more extensive specialty training and are supplemented by the usual general studies courses, including communication skills, and mathematics; but, like the certification programs, completion and subsequent employment usually require testing and further training, or both.

A number of associate degree/certificate programs are offered in a wide variety of technologies, designed to employ the graduate in pollution control and abatement areas. Among these technologies are: Water and Waste Water, Air, Water and Waste Water Control, Health, Safety and Environment, Environmental Control, Civil and Environmental Engineering, Coal Mining, Forest, Conservation Law, Auto Service and Wildlife. But the most widespread programs are degree/certificate programs leading to careers in ornamental horticulture and fields within agriculture, such as management, chemicals, production marketing, business and supply. The latter careers have no direct counterpart in environmental protection fields; still, proficiency in these disciplines will have important implications for agencies and industry engaged in the use and application of pesticides, and to a lesser degree, in the areas of air and water pollution.

While ancillary and supplemental courses are not included in the listing, every college has a full complement in the biological and physical sciences, mathematics and physics, to support training in the environmental specialties. As with prerequisite background study, social science study, interrelating man with his environment, is also an important part of the present system.

It cannot be said that all public community colleges in Illinois offer comprehensive programs in all the major pollution control and abatement areas, but the present curricular offerings indicate a wide spread and active interest by the system to respond to growing environmental concerns. This interest is demonstrated by 1973-1974 Illinois Community College enrollment figures which reflect that more than 500 students were either graduated from or completed programs in environmentally related disciplines, and of those graduates, (80% were in agricultural sciences and horticulture), nearly seventy-five percent were subsequently employed in environmental and agricultural fields. The remaining twenty-five percent were unaccounted for,went on to four year institutions or found employment outside the specialty for which they were trained. The figures for 1974-1975 enrollment in environmental programs were not available at the time this study was conducted, however, college officials anticipate continued growth, particularly in the water and agriculture fields.

The current curricula and graduation statistics illustrate that a broad-based foundation for environmental training already exists. Consequently, the proposed programs and the summary recommendations of the ensuing chapters will direct themselves to augmenting on-going and anticipated training efforts.

ILLINOIS PUBLIC COMMUNITY COLLEGE INVENTORY

The following curricular inventory of Illinois Public Community Colleges lists the courses and programs which have implications for environmental protection activities or are specific designs for training specialists in pollution control and abatement disciplines. This inventory, not elsewhere available, is offered as a reference tool for Illinois educational advisory and coordinating bodies as well as secondary and post-secondary educators, curriculum specialists/planners, administrators and prospective students.

KASKASKIA COLLEGE - District #501

Centralia, Illinois

Program: Agricultural Business (AAS)
Agricultural Science (Certificate)
Agricultural Production (AAS)
Community Education (Non-Credit)

Courses:

Ag	155	Agricultural Chemicals (3 hours)
Ag	121	Soils and Soil Supplements (4 hours)
Ag	123	Agricultural Processes Laboratory (4 hours)
Ag	124	Agricultural Crop Production (4 hours)
Ag	223	Plant and Animal Disease (3 hours)
Bio	123	Biology, Society and Man (3 hours)
Bio	205	Ecology (3 hours)
*HSE	092	Insecticides, Herbicides and Health (1 hour)
HSE	089	Pure Water and Health (1½ hours)
HSE	023	Soils and Fertilizers (1½ hours)
**CE	087	Conserving Our Natural Resources (2 hours)
CE	081	Controlling Air Pollution (1½ hours)

*Health, Safety and Environment
**Community Education

**CE 073 Environmental Conservation (2 hours)
Disposal Plant Operator (2 hours)
Water Plant Operation - Basic (2 hours)
Water Plant Operation - Intermediate (2 hours)
Water Plant Operation - Advanced (2 hours)

**Community Education

COLLEGE OF DUPAGE - Dsitrict #502

Glen Ellyn, Illinois

Program: Not Known
Courses:
Geog 101 Human Geography
*OH 101 Soils and Fertilizer
OH 102 Greenhouse Operation and Procedure
OH 112 Landscape - Garden Maintenance
OH 231 Turf Growth and Maintenance
OH 241 Trees and Woody Plants
Principles of Water Plant Operation - Basic
Principles of Water Plant Operation - Intermediate
Principles of Water Plant Operation - Advanced

*Ornamental Horticulture

BLACK HAWK COLLEGE - District #503

Moline, Illinois

Program: Not Known
Courses:
Biol 120 Man and His Environment I
Biol 121 Man and His Environment II
Biol 200 Environmental Biology (2 hours)
Biol 201 Environmental Biology (2 hours)
*AdEd 2050 Ecology-Human
AdEd 2060 Environmental Control Systems (2± hours)
AdEd 4600 Wastewater Treatment Plant Operator Beginning (4± hours)
AdEd 4601 Wastewater Treatment Plant Operator Advanced (4± hours)

*Adult Education

BLACK HAWK COLLEGE EAST - District #503

Kewanee, Illinois

Program: Agricultural Production (AAS)
Agricultural Supply (AAS)
Agricultural Transfer (AS)

Courses:

Ag 131	Soils and Soil Fertility (5 hours)
Ag 131-A	Introductory Soil Science (4 hours)
Ag 132	Field Crop Science (4 hours)
Ag 132-A	Field Crop Science (4 hours)
Ag 133	Agricultural Chemicals (3 hours)
Ag 151	Materials Handling Equipment (2 hours)

TRITON COLLEGE - District #504

River Grove, Illinois

Program: Ornamental Horticulture (AAS)
Ornamental Horticulture (Certified)

Courses:

*ARC 181	Planning of Cities and Regions (3 hours)
**ORN 101	Basic Ornamental Horticulture (3 hours)
ORN 025	Advanced Ornamental Horticulture (3 hours)
ORN 012	Plant Disease and Pests (3 hours)
ORN 030	Floriculture (4 hours)
ORN 035	Soils and Nutrition (2 hours)
ORN 080	Greenhouse Management and Practice (3 hours)
ORN 085	Turf and Lawn Management (3 hours)
ORN 090	Trees and Shrubs (3 hours)

*Architecture
**Ornamental Horticulture

PARKLAND COLLEGE - District #505

Champaign, Illinois

Program: Agri Production (AAS)
Agri Marketing (AAS)
Agri Supply (AAS)
Agri Business (Certificate)
Agri Production (Certificate)

Courses:

AGB 111	Applied Plant Science (4 hours)
AGB 112	Applied Animal Science (5 hours)
AGP 208	Surveying for Soil and Water Conservation (4 hours)
AGR 103	Introduction to Crop Science (4 hours)
AGS 201	Soil Fertility and Fertilizers (4 hours)
AGS 202	Crop Ecology (4 hours)
AGS 203	Herbicides, Insecticides, Fungicides (4 hours)

BIO 210	Population, Resources, and Environment (4 hours)
Sci 101	Problems in Human Ecology I (4 hours)
Sci 102	Problems in Human Ecology II (4 hours)
AGP 209	Design for Soil and Water Conservation (4 hours)
AGB 115	Turf Management (4 hours)

SAUK VALLEY COLLEGE - District #506

Dixon, Illinois

Program: Agri Business Management (AAS)
Agri Business Option (Certificate)
Agri Production Option (Certificate)
Ornamental Horticulture (Certificate)

Courses:

AGR 104	Principles of Soil Fertility and Fertilizers (4 hours)
AGR 106	Crops and Soil Diagnosis (2 hours)
AGR 107	Surveying for Soil and Water Conservation (3 hours)
AGR 201	Crop Science (3 hours)
AGR 202	Agri Chemicals and Supplies (3 hours)
AGR 115	Fundamentals of Animal Science (3 hours)
AGR 116	Principles of Animal Science (3 hours)
AGR 142	Principles of Ornamental Horticulture (3 hours)
AGR 143	Home Grounds Planning (3 hours)
BIO 120	Environmental Health (3 hours)
CHE 104	Introduction to Scientific Instrumentation (3 hours)

DANVILLE JUNIOR COLLEGE - District #507

Danville, Illinois

Program: Agriculture (AS)
Agricultural Careers (AAS)

Courses:

AGR 186	Soil Fertility (3 hours)
AGR 207	Agri Chemicals (5 hours)
*Cons 100	Introductory Ecology (3 hours)
Cons 201	Wildlife Management (3 hours)
**LH 294	Disease and Insects (3 hours)
***TH 191	Turf Management I (3 hours)
TH 280	Turf Management II (3 hours)

BIO 105	Introduction to Environment (3 hours)
****OS 181	Agricultural Botany (3 hours)
AGR 207-1	Agri Chemicals (2 hours)
AGR 180	Soils
AGR 182	Greenhouse Management I
AGR 188	Grounds Maintenance
AGR 189	Turf Grass Culture

*Conservation
**Landscape Horticulture
***Turf Horticulture
****Occupational Science

KENNEDY KING COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Not Known

Courses:

*ES 101	Man and Environment I (3 hours)
**ES 102	Man and Environment II (3 hours)

*Environmental Studies

LOOP COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Wastewater Technology (Certified)
Ornamental Horticulture (Certificate)

Courses:

*ECT 106	Cooperative Work Experience I (2-4 hours)
ECT 107	Cooperative Work Experience II (2-4 hours)
ECT 203	Water Supply and Wastewater Collection (3 hours)
Bio 110	Human Ecology (3 hours)
ECT 206	Sanitary Chemistry and Biology (4 hours)
ECT 207	Water Purification (4 hours)
ECT 208	Wastewater Treatment (3 hours)
**ES 101	Man and Environment I (3 hours)
ES 102	Man and Environment II (3 hours)

*Environmental Control Technology
**Environmental Science

***H 102	Lawn and Turf Management (3 hours)
H 103	Insect and Disease Control (3 hours)
H 208	Soil and Fertilizers (3 hours)

Chem 217	Introduction to Instrumental Analysis (4 hours)
Chem 218	Advanced Techniques in Instrumental Analysis (4 hours)
PS 107	Current Public Issues in Physical Science (3 hours)

***Horticulture

MALCOLM X COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Not Known

Courses:

*ES 101	Man and Environment I (3 hours)
*ES 102	Man and Environment II (3 hours)

*Environmental Studies

OLIVE-HARVEY COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Environmental Control Technology (AAS)
Environmental Control Technology - General (Certificate)
Environmental Control Technology - Treatment (Certificate)

Courses:

*ECT 101	Introduction to Environmental Control Technology (3 hours)
ECT 101	Water Supply and Pollution (4 hours)
ECT 103	Air, Noise and Solid Waste Pollution (4 hours)
ECT 106	Cooperative Work Experience I (2-4 hours)
ECT 107	Cooperative Work Experience II (2-4 hours)
ECT 200	Basic Hydraulics for Water and Wastewater (4 hours)
ECT 203	Water Supply and Wastewater Collection (3 hours)
ECT 206	Sanitary Chemistry and Biology (4 hours)
ECT 207	Water Purification (4 hours)
ECT 208	Wastewater Treatment (3 hours)

*Environmental Control Technology

Chem 217	Introduction to Instrumental Analysis (4 hours)
Chem 218	Advanced Techniques in Instrumental Analysis (4 hours)
**ES 101	Man and Environment I (3 hours)
ES 102	Man and Environment II (3 hours)
PS 107	Current Public Issues in Physical Science (3 hours)

**Environmental Studies

SOUTHWEST COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Not Known

Courses:

*ES 101	Man and Environment I (3 hours)
ES 102	Man and Environment II (3 hours)

*Environmental Studies

WILBUR WRIGHT COLLEGE - Chicago City Colleges - District #508

Chicago, Illinois

Program: Agriculture (AA)
Horticulture (Certificate)

Courses:

Bio 101	Human Ecology (3 hours)
*ES 101	Man and Environment I (3 hours)
ES 102	Man and Environment II (3 hours)
**H 102	Lawn and Turf Management (3 hours)
H 103	Insect and Disease Control (3 hours)
Chem 217	Introduction to Instrumental Analysis (4 hours)
Chem 218	Advanced Technology in Instrumental Analysis (4 hours)

*Environmental Science
**Horticulture

ELGIN COMMUNITY COLLEGE - District #509

Elgin, Illinois

Program: Auto Service Technology (AAS)

Courses:

Agri 102	Crop Production (3 hours)

Biol	101	Introduction to Ornamental Horticulture (3 hours)
*EH	101	Wastewater Control (3 hours)
EH	102	Water Supply and Treatment (3 hours)
EH	104	Advanced Water Supply and Treatment (3 hours)
Sci	115	Human Geography (3 hours)
Geo	116	Human Geography (3 hours)
Auto	278	Crankcase and Exhaust Emission Control (2 hours)

*Environmental Health

THORNTON COMMUNITY COLLEGE - District #510

Thornton, Illinois

Program: Not Known

Courses:

BIO	103	Environmental Biology (8 hours)
BIO	152	Man and His Environment (3 hours)
Engl	151	Ecological Literature (2 hours)

ROCK VALLEY COLLEGE - District #511

Rockford, Illinois

Program: Health, Safety and Environment (Certificate)

Courses:

Ag	106	Introduction to Animal Science (3 hours)
**ES	203	Conservation and Natural Resources (3 hours)
Bio	264	Environmental Biology (4 hours)
*HSE	700E	Fertilizers and Soil Fertility
HSE	701E	Organic Gardening
HSE	715E	Environmental Science
HSE	720E	Survey of Water Pollution
Bus	242	City Planning and Urban Land Development (3 hours)

*Health, Safety and Environment
**Environmental Science

WILLIAM RAINEY HARPER COLLEGE - District #512

Palatine, Illinois

Program: Not Known

Courses:

Bio	103	Man and Environment (3 hours)

ILLINOIS VALLEY COMMUNITY COLLEGE - District #513

Oglesby, Illinois

. Program: Agricultural Production and Management (AAS)
Agricultural Supply and Service (AAS)
Recreational Facilities Management (AASP)

Courses:
Bio 110 Man and His Environment
Agri 110 Soils and Soil Fertility (3 hours)
Bio 104 Man and His Environment (3 hours)
Chem 121 Agricultural Chemistry (4 hours)
*RFM 125 Sanitation (3 hours)
RFM 122 Conservation of Natural Environment (3 hours)
WWT 120 Wastewater Treatment I (2 hours)
WWT 121 Wastewater Treatment II (2 hours)

*Recreational Facility Management

ILLINOIS CENTRAL COLLEGE - District #514

Peoria, Illinois

Program: Agri Business Management (AAS)
Ornamental Horticulture (AAS)
Wastewater Treatment (Certificate)
Water Treatment (Certificate)

Courses:
Agri 113-3 Principles of Soil Fertility (3 hours)
Agri 200-4 Introductory Soil Science (4 hours)
Agri 201-4 Crop Production (4 hours)
Agri 203-4 Chemicals of Agriculture (4 hours)
HORT 111-3 Plant Diseases/Insects and Their Control (3 hours)
HORT 230-3 Turf Management I (3 hours)
HORT 231-3 Turf Management II (3 hours)
HORT 002-1 Selection, Care and Maintenance of Shade Trees (1 hours)
ENGPR 003-½ Vehicle Exhaust Emission Control (½ hour)
Agri 005-1 Managing Farm Ponds (1 hour)
WST 080-2 Wastewater Treatment I (2 hours)
WST 081-2 Wastewater Treatment II (2 hours)
WST 082-2 Wastewater Treatment Advanced (2 hours)
WST 090-2 Principles of Water Plant Operation - Basic (2 hours)
WST 091-2 Principles of Water Plant Operation - Intermediate (2 hours)
WST 092-2 Principles of Water Plant Operation - Advanced (2 hours)

PRAIRIE STATE COLLEGE - District #515

Chicago Heights, Illinois

Program: Air, Water and Wastewater Control (AAS)
Air, Water and Wastewater Control (Certificate)

Courses:

*AWT 101	Water and Wastewater Treatment Processes (3 hours)
AWT 102	Air Treatment Processes (2 hours)
AWT 201	Water Distribution and Sewage Collection Systems (3 hours)
AWT 203	Laboratory Methods (3 hours)
AWT 202	Local Government Funding and Statutory Enforcement (4 hours)
AWT 204	Industrial Wastes and Discharges (3 hours)
AWT 205	Water Distribution (3 hours)
AWT 204	Air Instrumentation (3 hours)

*Air Water and Wastewater Technology

WAUBONSEE COMMUNITY COLLEGE - District #516

Sugar Grove, Illinois

Program: Auto Service Technology (AAS)
Environmental Control Technology (AAS)
Environmental Control Technology (Certificate)

Courses:

Auto 278	Crankcase and Exhaust Emission Control (2 hours)
*ECT 151	Wastewater Treatment I (3 hours)
ECT 152	Wastewater Treatment II (3 hours)
ECT 153	Water Treatment I (3 hours)
ECT 154	Chemical Analysis of Water and Wastewater I (3 hours)
ECT 155	Water Treatment II (3 hours)
ECT 156	Chemical Analysis of Water and Wastewater II (3 hours)

*Environmental Control Technology

LAKELAND COLLEGE - District #517

Mattoon, Illinois

Program: Agricultural Business and Supply (AAS)
Agricultural Production and Management (AAS)
Water Treatment (Certificate)
Wastewater Treatment (Certificate)

Courses:
Ag 15.061 Intro to Agricultural Farm Supply Business (4 hours)
Ag 15.063 Animal Husbandry (4 hours)
Ag 15.064 Soil Fertility and Fertilizers (4 hours)
Ag 15.067 Principles of Crop Production (4 hours)
Ag 15.088 Agricultural Chemicals (4 hours)
Ag 15.200 Principles of Field Crop Science (5 hours)
Bio 56.201 Environmental Science (4 hours)
Wastewater Operator - Basic (4 hours)
Wastewater Operator - Advanced (4 hours)
Water Treatment Operator - Basic (4 hours)
Water Treatment Operator - Advanced (4 hours)

CARL SANDBURG COLLEGE - District #518

Galesburg, Illinois

Program: Agri Production (AAS)
Agri Business (AAS)
Agri Resources (AAS)
Public Service Careers - Water Division (AAS)
Public Service Careers - Inspection Division (AAS)
Public Service Careers - Water Division (Certificate)
Public Service Careers - Inspection Division (Certificate)
Wastewater Technology (Certificate)

Courses:
Ag 101 Soil Science I (4 hours)
Ag T101 Applied Soil Science I (5 hours)
Ag 105 Soil Science II (3 hours)
Ag T105 Applied Soil Science II (5 hours)
Ag 108 Applied Crop Production (4 hours)
Ag T108 Introduction to Horticulture (4 hours)
Ag 134 Introduction to Horticulture (4 hours)
Ag T234 Conservation of Natural Resources (4 hours)
*GE 254 Conservation of Natural Resources (4 hours)
**PN T117 Environmental Health (1 hour)
***SC T294 Water Supply and Pollution Control I (4 hours)
SC T295 Water Supply and Pollution Control II (4 hours)

*Geography
**Practical Nursing
***Service Careers

***SC T296 Air Pollution (4 hours)
SC T297 Solid Waste Disposal (4 hours)
WWT 101 Introduction to Wastewater Technology (3 hours)
WWT 102 Primary Treatment I (3 hours)
WWT 103 Secondary Treatment I (3 hours)

WWT	104	Laboratory Control I (3 hours)
WWT	106	Secondary Treatment II (3 hours)
WWT	107	Sludge Handling and Digestion (3 hours)
WWT	108	Laboratory Control II (3 hours)
WWT	109	Tertiary and Advanced Treatment (3 hours)
WWT	110	Plant Management and Public Relations (3 hours)

***Service Careers

HIGHLAND COMMUNITY COLLEGE - District #519

Freeport, Illinois

Program: Agri-Management (AAS)
Agri Business (AAS)

Courses:

Agri 286	Field Crop Science (4 hours)
Agri 122	Agricultural Chemicals (3 hours)
Agri 227	Field Crop Science (3 hours)
BIO 116	Introduction to Ecology (4 hours)

KANKAKEE COMMUNITY COLLEGE - District #520

Kankakee, Illinois

Program: General Agriculture (Certificate)
Agri Production and Management (AAS)
Agri Business (AAS)

Courses:

*AGRC 1223	Fertilizers and Fertility (3 hours)
AGRC 1534	Plant Science (4 hours)
AGRC 1614	Introductory Soils (4 hours)
AGRC 2313	Agricultural Chemicals (3 hours)

*Agriculture

REND LAKE COLLEGE - District #521

Ina, Illinois

Program: Agri Business (AAS)
Agri Production (AAS)
Agri Production and Management (Certificate)

Courses:

AgBus	125	Soils and Fertilizers (5 hours)
AgBus	126	Agricultural Chemicals (3 hours)
AgBus	127	Crop Production (4 hours)
AgBus	121	Introduction to Animal Science (4 hours)
Biol	111	Biology

BELLEVILLE AREA COLLEGE - District #522

Belleville, Illinois

Program: Agri Business and Supply (AAS)
Horticulture (AAS)
Horticulture (Certified)

Courses:

AGR 122	Soil Fertility and Fertilizers (3 hours)
AG HORT 102	Introduction to Horticulture (3 hours)
AG HORT 135	Turf Management (3 hours)
AG HORT 136	Identification and Use of Ornamentals (3 hours)
AG HORT 152	Greenhouse Management (3 hours)
AG HORT 175	Home Gardening (2 hours)
AG HORT 235	Advanced Turf Management (3 hours)
AG HORT 237	Aboriculture (3 hours)
AG HORT 242	Fruit Production (3 hours)
AG HORT 252	Advanced Greenhouse Management (3 hours)
Bio 103	Principles of Environmental Biology (4 hours)
Bio 108	Ecology and Field Biology (4 hours)
Farm Management Practices	
Farm Chemicals and Their Use	
Greenhouse Management	
AGR 121	Soil Science (4 hours)

KISWAUKEE COLLEGE - District #523

Malta, Illinois

Program: Agri Management (AAS)
Crop Production (AAS)
Horticulture (AAS)
Livestock Production (AAS)
Ornamental Horticulture (AAS)

Courses:

AG	115	Agricultural Chemicals (3 hours)
AG	131	Introduction to Conservation (3 hours)
AG	216	Soil and Fertilizer Management (3 hours)
AG	246	Feeder Cattle Management (3 hours)

Ag	248	Swine Health and Herd Management (3 hours)
Biol	101	Man and His Environment (3 hours)
*OH	122	Trees-Aboriculture I (4 hours)
OH	126	Nursery Management (3 hours)
OH	136	Ornamental Shrubs-Maintenance (3 hours)
OH	146	Perennial Flowers (3 hours)
OH	231	Ornamental Shrubs-Identification and Culture (3 hours)
OH	256	Turf and Lawn Management (3 hours)
Ag	048	Swine Production (1 hour)
Ag	091	Lawn Care and Management (1 hour)
Ag	098	Plant Nutrition (2 hours)
OH	257	Advanced Turf Management (3 hours)

*Ornamental Horticulture

MORAINE VALLEY COMMUNITY COLLEGE - District #524

Palos Hills, Illinois

Program: Health, Safety and Environment (Certificate)

Courses:

*NAT	111	Environmental Science I (4 hours)
NAT	112	Environmental Science II (4 hours)
		Water Plant Operation - Basic
		Water Plant Operation - Intermediate
		Water Plant Operation - Advanced

*Natural Science

JOLIET JUNIOR COLLEGE - District #525

Joliet, Illinois

Program: Agri Business (AAS)
Agri Production and Management (AAS)
Horticulture Landscaping (AAS)
Horticulture Turf (AAS)
Horticulture Nursery (AAS)
Horticulture Floriculture (AAS)
Automotive Service (AAS)
Health, Safety and Environmental Improvement (Certificate)
Community and Civic Development Education (Certificate)

Courses:

Ag	105	Crop Production (4 hours)
Ag	127	Fertilizers and Soil Fertility (3 hours)
Ag	223	Agri and Chemical Supplies (3 hours)
AUTO	116	Carburetion (2 hours)

Biol	146	Ecological Conservation (3 hours)
*CCD	905	City Planning for the Future (1 hour)
**HSE	903	Air and Water Pollution (1 hour)
***HORT	162	Woody Ornamentals (3 hours)
HORT	243	Entomology (3 hours)
HORT	260	Turf Management I (3 hours)
HORT	261	Turf Mangagement II (3 hours)
HORT	281	Greenhouse Management and Production (3 hours)

*Community and Civic Development
**Health, Safety and Environmental Improvement
***Horticulture

LINCOLN LAND COMMUNITY COLLEGE - District #526

Springfield, Illinois

Program: Agri Business Management (AAS)
Automotive Technology (AAS)
Civil and Environmental Engineering Technology (AAS)

Courses:

*ABM	102	Swine and Related Animal Production (3 hours)
ABM	104	Fertilizers (3 hours)
ABM	105	Crop Production (3 hours)
ABM	109	Beef and Ruminant Production (3 hours)
ABM	201	Agricultural Pesticides (3 hours)
Agr	102	Animal Science (4 hours)
Agr	105	Crop Science (4 hours)
AUT	209	Auto Emission Control (2 hours)
BIO	210	Entomology (4 hours)
Agr	203	Soil Science (4 hours)

Water Plant Operation - Basic
Water Plant Operation - Intermediate

*Agri Business Management

MORTON COLLEGE - District #527

Cicero, Illinois

Program: Not Known

Courses:

Bio	106	Survey of Wastewater and Air Pollution (3 hours)

EVC	222	Environmental Regulations (4 hours)
EVC	232	Environmental Reports (4 hours)
OSH	112	Occupational Safety and Health (4 hours)

*Environmental Conservation

OLNEY CENTRAL COLLEGE - Illinois Eastern College District #529

Olney, Illinois

Program: Automotive Technology (AAS)

Courses:

AUTO	152	Fuel and Emission Control Systems (8 hours)
AGO	172	Fertilizers in Agriculture (3 hours)
AGO	182	Chemicals in Agriculture (3 hours)

WABASH VALLEY COLLEGE - Illinois Eastern College - District #529

Mt. Carmel, Illinois

Program: Agri-Business (AAS)
Management of Agriculture Production (AAS)
Coal Mining Technology (AAS)
Coal Mining Technology (Certificate)

Courses:

AGR	162	Fertilizers
AGR	212	Agricultural Chemicals
CMS	122	Coal Mine Atmosphere (4 hours)
CMS	142	Coal Mine Ventilation (4 hours)
AGO	172	Fertilizers in Agriculture (3 hours)
AGO	182	Chemicals in Agriculture (3 hours)

JOHN A. LOGAN COLLEGE - District #530

Carterville, Illinois

Program: Agri Supply and Services (AAS)
Agri Supply and Services (Certificate)
Automotive Technology (AAS)

Courses:

AUTO		Emission Controls and Testing (2 hours)
AGR	125	Soils and Fertilizers (5 hours)
AGR	126	Agricultural Chemicals (3 hours)
BIO	245	Conservation of Natural Resources (3 hours)

SHAWNEE COLLEGE - District #531

Ullin, Illinois

Program: Agricultural Business (AAS)
Agricultural Resources (AAS)
Animal and Crop Science (AAS)
Greenhouse Management (Certificate)
Horticulture-Nursery Management (Certificate)
Horticulture Technology (Certificate)
Turfgrass Management (Certificate)
Wastewater Treatment Technology (Certificate)
Water and Wastewater Technology (Certificate)
Wildlife Technology (AAS)
Automotive Mechanics (Certificate)
Conservation Law Technology (AAS)

Courses:

Agr	124	Soil Science (3 hours)
Agr	127	Conservation of Natural Resources (3 hours)
Agr	128	Conservation of Water Resources (3 hours)
Agr	129	Surveying (3 hours)
Agr	132	Crop Science (3 hours)
Agr	222	Grain Production (3 hours)
Agr	228	Wildlife Management (3 hours)
Agr	230	Application and Use of Agricultural Chemicals (3 hours)
Bio	211	Environmental Biology (4 hours)
Aut	118	Exhaust Emission Control (2 hours)
*OHT	125	Turfgrass Culture (4 hours)
OHT	127	Nursery Operation (4 hours)
OHT	128	Insect, Pest, and Plant Disease (3 hours)
OHT	130	Greenhouse Management (3 hours)
**WWT	121	Introduction to Water and Wastewater Technology (2 hours)
WWT	122	Water and Sewage Purification (2 hours)
WWT	126	Sewage Treatment (5 hours)
WWT	127	Water Treatment (5 hours)
WWT	130	Health and Sanitation (2 hours)
WWT	131	Coding and Planning (1 hour)
WWT	132	Water and Wastewater Mechanics (2 hours)
WWT	133	Water and Wastewater Internship (5 hours)

*Horticultural Science
**Water and Wastewater Technology

COLLEGE OF LAKE COUNTY - District #532

Grayslake, Illinois

Program: Ornamental Horticulture (AS)

Courses:

Bio	101	Man and His Environment I (3 hours)
Bio	102	Man and His Environment II (3 hours)
*OHT	114	Soils, Fertilizer and Water (3 hours)
OHT	116	Insects, Disease and Control (3 hours)
OHT	211	Turf Management I (3 hours)
OHT	212	Turf Management II (3 hours)
Bio	131-001	Lake Environment Weekend Workshop (non-credit)
**EGR	131-001	Fundamentals of Wastewater Treatment (non-credit)
EGR	132-001	Special Topics on Wastewater Treatment (non-credit)
EGR	133-001	Fundamentals of Water Operation (non-credit)
EGR	134-001	Chemistry of Wastewater Operation (non-credit)

*Ornamental Horticulture
**Engineering

SOUTHEASTERN ILLINOIS COLLEGE - District #533

Harrisburg, Illinois

Program: Agri Supply and Business (AAS)
Agri Production Management (AAS)
Forestry Technology (AAS)

Courses:

*ASB	151	Animal Science (3 hours)
ASB	152	Crop Production (3 hours)
ASB	252	Fertility (3 hours)
ASB	254	Agricultural Chemicals (3 hours)
ASB	258	Materials Handling Equipment (3 hours)
Agr	121	Introductory Animal Science (3 hours)
Agr	221	Introductory Crop Production (3 hours)
**FOR	115	Applied Silviculture (4 hours)
FOR	214	Wildlife Ecology (2 hours)
FOR	215	Forest Product Utilization (2 hours)
***GEO	121	Geography of Man (4 hours)

*Agricultural Supply Business
**Forestry
***Geography

SPOON RIVER COLLEGE - District #534

Canton, Illinois

Program: Agri Management Technology (AAS)
Agri Supply (AAS)
Health, Safety and Environment (Certificate)

Courses:

AG	102	Introduction to Crop Science (4 hours)
AG	103	Introduction to Soil Science (4 hours)
AG	104	Introduction to Animal Science (3 hours)
*AMT	010	Conservation (2 hours)
AMT	060	Plant and Field Crop Management (4 hours)
AMT	070	Animal Nutrition and Management (6 hours)
BIO	140	Human Ecology (3 hours)
**ERSCI	221	Conservation of Natural Resources (3 hours)
ERSCI	222	Regional Problems in Conservation (3 hours)
***CHSE	007	Wildlife Conservation (2 hours)
CHSE	078	Forestry Conservation and Management (2 hours)
CHSE	079	Fisheries Conservation and Management

*Agricultural Management Technology
**Earth Science
***Certificate of Health, Safety, and Environment

OAKTON COMMUNITY COLLEGE - District #535

Morton Grove, Illinois

Program: Not Known

Courses:

*NSC	106	Introduction to Environmental Science (4 hours)
NSC	101	Introduction to Life Science (4 hours)

*Natural Science

LEWIS AND CLARK COMMUNITY COLLEGE - District #536

Godfrey, Illinois

Program: Water Treatment (Certificate)
Wastewater Treatment (Certificate)
Agri-Business Management (AAS)

Courses:

*AGSC	135	Principles of Field Crop Production (3 hours)
AGSC	136	Introduction to Animal Science (3 hours)
AGSC	184	Livestock Production (2 hours)
AGSC	185	Agricultural Ecology Seminar (2 hours)
AGSC	243	Soils II (3 hours)
**PHSC	135	Environmental Geography (3 hours)

*Agricultural Science
**Physical Science

WATR	131	Water Plant Operations I (3 hours)
WATR	134	Water Plant Operations II (3 hours)
WATR	141	Introduction to Environmental Problems (3 hours)
WATR	151	Wastewater Plant Operations I (3 hours)
WATR	152	Wastewater Plant Operations II (3 hours)
*AGSC	130	Ecology (2 hours)

*Agricultural Science

RICHLAND COMMUNITY COLLEGE - District #537

Decatur, Illinois

Program: Not Known

Courses:
Agric 130 Introductory Crop Science (5 hours)
Gardening and Landscaping
Water Plant Operations - Basic
Water Plant Operations - Intermediate

STATE COMMUNITY COLLEGE OF EAST ST. LOUIS - District #601

East St. Louis, Illinois

Program: Horticulture (Certificate)

Courses:

Ecol	131	Ecology (4 hours)
Agri	150	Introduction to Horticulture (4 hours)
Agri	155	Soil Science (4 hours)
Agri	156	Turf Management (4 hours)

Model Curricula

SUGGESTED CURRICULA FOR ILLINOIS PUBLIC COMMUNITY COLLEGE ASSOCIATE DEGREE/CERTIFICATE PROGRAMS IN ENVIRONMENTAL/ENERGY EDUCATION

The suggested programs and course descriptions presented in the following pages include the environmental fields of air, noise, pesticides, potable water, potable/waste water, radiation, solid waste and waste water. A general curriculum to train an environmental technologist, involving coursework from all the above fields, has also been included. These program options have been developed from a study of ongoing and proposed Illinois Community College offerings, recommendations by professionals working in the field and an impact analysis of existing and forthcoming environmental legislative mandates on career employment in Illinois.

In formulating these programs, considerable attention was given to developing core course uniformity among the several fields of study. A greater commanality of basic courses would augment facility operation and institutional flexibility by permitting students to transfer (without credit loss) to a district where the appropriate on-site or in-house training facility is available. This system would also have the effect of reducing faculty load, course duplication and expensive training facility construction.

The accompanying course descriptions are oriented, in the main, to a vocational-technical type of career training. Some of the fields necessarily require a more academic approach, but wherever possible the coursework is focused on a type of training leading directly to job placement. Yet, completion of any of these programs will provide a sound basis for advanced work at a four year or graduate institution and senior institutions should provide capstone experiences which would interface with these programs. The individual course overviews do not go into extensive detail, but they do outline the basic thrust of the work and are intended only as a point of departure for curricular planners.

2 YEAR ASSOCIATE DEGREE IN
AIR POLLUTION TECHNOLOGY
(Air Pollution Specialist)

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Mathematics I	3	3
Chemistry I	3	6
Physics I	3	4
Introduction to Air Pollution Control	2	2
Ecosystems	2	2
Total	16	

Second Semester		
Mathematics II (Air Option)	3	3
Chemistry II (Air Option)	3	6
Physics II (Air Option)	3	4
Instrumentation I (Air Option)	3	3*
Meteorology	3	3
Total	16	

Summer Internship

Three weeks of on-the-job training
at one or more air pollution
monitoring stations.

Third Semester		
Engineering Technology	3	3
Public Relations & Communication	2	2
Air Pollution Monitoring	3	3*
Computer Technology	3	3
Instrumentation II (Air Option)	3	3*
Safety	2	2
Total	16	

Fourth Semester		
Pollution Abatement (Air Option)	3	3
Environmental Regulations (Air Option)	2	2
Pollution Abatement (Air Option)	3	3*
Statistics	3	3
Automobile Emissions	2	2
Source Identification	3	3
Total	16	

Summer Internship

Three weeks of on-the-job training at one
or more air pollution control/abatement
facilities.

* Supplemented by one eight hour Saturday field trip during the semester.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Air Pollution Technology
Course Descriptions

AIR POLLUTION CONTROL/ABATEMENT 2 hours
(2 fifty minute classroom sessions per week supplemented by 1 eight hour field exercise during the semester)

A comprehensive study of the techniques and application of air pollution control/abatement. Sulfur dioxide scrubbers, electrostatic precipitators, and allied gaseous/particulate controls will be emphasized. Equipment controls (electric, pneumatic, mechanical, and computerized) will also receive attention.

AIR POLLUTION MONITORING 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field exercise during the semester)

A comprehensive study of the monitoring and sampling technology utilized in air pollution control. Stack sampling, smoke reading and monitoring stations will be emphasized.

AUTOMOBILE EMISSIONS 2 hours
(2 fifty minute classroom sessions per week)

A comprehensive study of the internal combustion engine as it relates to air quality. Monitoring, testing, and community awareness programs will be emphasized. Technological advancements in engines will receive appropriate attention.

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory techniques.

CHEMISTRY II (Air Option) 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A continuation of Chemistry I with a detailed examination of characteristics and identification of non-methane hydrocarbons, carbon monoxide, nitrogen, dioxide, sulfur dioxide and photochemical oxidants.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on auido-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS (Air Option) 3 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing air pollution, including a general examination of those regulations pertaining to other pollution control and abatement fields.

INSTRUMENTATION I (Air Option) 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field exercise during the semester)

An introduction to the use of instrumentation in air pollution monitoring and control; terminology, equipment and technique are emphasized.

INSTRUMENTATION II (Air Option) 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field exercise during the semester)

A comprehensive continuation of Instrumentation I with detailed examination of electronic monitoring equipment, e.g., gas chromatography, scintillation spectroscope, infrared and ultraviolet spectrometry.

INTRODUCTION TO AIR POLLUTION CONTROL 3 hours
(3 fifty minute classroom sessions per week)

A basic introduction to the field of Air Pollution Control, which will include an overview of the history, technological advancements, present conditions, general monitoring techniques, controls and the economics of control and abatement practices.

MATHEMATICS I 2 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II (Air Option) 3 hours

A continuation of Mathematics I with emphasis on algebra and basic calculus. Calculations and problem solving as they pertain to the air pollution field will be emphasized.

METEOROLOGY 3 hours
(3 fifty minute classroom sessions per week)

A study of the science of meteorology and its relationship to topography, with emphasis on atmospheric conditions, winds, air currents and diffusion.

PHYSICS I 3 hours
(2 fifty minute classroom sessions per week and 2 two hour laboratory sessions per week)

An introduction to basic physics.

PHYSICS II (Air Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory per week)

A continuation of Physics I with emphasis on thermodynamics, fluids and energy conversion.

POLLUTION ABATEMENT (Air Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, air and water. Emphasis will be given to the factors involving air pollution control.

PUBLIC RELATIONS AND COMMUNICATIONS 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

SAFETY 2 hours
(2 fifty minute classroom sessions per week)

A comprehensive study of the principles of safety including an examination of the Occupational Safety and Health Act, including the implications of its enforcement. Basic first aid techniques will be emphasized.

SOURCE IDENTIFICATION 3 hours
(3 fifty minute classroom sessions per week)

A general environmental course which examines typical air pollution sources, chronic industrial categories, and broad categorical identifications. Additional study will be given to site selection for monitoring stations and the hazards of various emissions.

STATISTICS 3 hours
(3 fifty minute classroom sessions per week)

An introduction to statistics, its use, application and interpretation as it pertains to air quality monitoring data. Principles and terminology are of basic importance.

2 YEAR ASSOCIATE DEGREE IN NOISE ABATEMENT TECHNOLOGY

(Noise Abatement Specialist)

First Semester	Credit Hrs	Class Hrs
Introduction to Noise Control & Abatement	3	3
Mathematics I	3	3
English Composition	3	3
Physics I	3	4
Ecosystems	2	2
Total	14	

Second Semester	Credit Hrs	Class Hrs
Audio-Biology	3	6
Mathematics II (Noise Option)	3	3
Physics II (Noise Option)	3	4
Introduction to Electronics	3	3
Computer Technology	3	3
Total	15	

Summer Internship

Three weeks of on-the-job training with a noise abatement oriented governmental agency or with a private organization involved in the noise abatement/control field.

Third Semester	Credit Hrs	Class Hrs
Engineering Technology	3	3
Public Relations and Communication	2	2
Slide Rule Usage	2	2
Acoustics	3	3*
Instrumentation I (Noise Option)	3	4
Practical Computer Application	3	3
Total	16	

Fourth Semester	Credit Hrs	Class Hrs
Pollution Abatement (Noise Option)	3	3
Statistics and Probability	3	3
Environmental Regulations (Noise Option)	2	2
Instrumentation II (Noise Option)	3	3
Safety	2	2
Noise Sources	3	3*
Total	16	

Summer Internship

Three weeks of on-the-job training with a noise abatement oriented government agency or with a private organization involved in the noise abatement/control field.

* Supplemented by one eight hour Saturday field trip during the semester.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Noise Abatement Technology
Course Descriptions

ACOUSTICS   3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A practical study in the branch of physics dealing with the transmission of sound. Current technology in design, materials, and technique relating to the control of sound transmission will be emphasized.

AUDIO-BIOLOGY   3 hours
(2 fifty minute classroom sessions and 2 hour laboratory sessions per week)

An introductory study of the effects of noise levels on organisms.

COMPUTER TECHNOLOGY   3 hours
(3 fifty minute classroom sessions per week)

An introduction to the use of electronic computers, including terminology, logic, programming, computer capability and hardware.

ECOSYSTEMS   2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY   3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION   3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS   (Noise Option)   2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing noise including a general examination of the regulations pertaining to other pollution control and abatement fields.

INSTRUMENTATION I (Noise Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

An introductory study in scientific instrumentation, equipment, standardization and quality control. A basic study of terminology and inventorying sound instrumentation equipment will be emphasized.

INSTRUMENTATION II (Noise Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

A continuation of Instrumentation I with emphasis on sound control and detection instrumentation, tone analyzers, microphones and sound level meters. Testing, preventative maintenance and repair will also be emphasized.

INTRODUCTION TO ELECTRONICS 3 hours
(3 fifty minute classroom sessions per week)

An introductory study of the behavior and control of electrons in vacuums and gases. Specific emphasis will be given to the practical application of electronics in the fields of instrumentation, computers and acoustics.

INTRODUCTION TO NOISE CONTROL & ABATEMENT 3 hours
(3 fifty minute classroom sessions per week)

A basic introduction to the field of noise, to include health effects, history, regulatory trends and the present situation in control and abatement practices.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the functions of addition, subtraction, multiplication, and division, including an introduction to geometry, algebra, equations and problem solving.

MATHEMATICS II 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on algebra and calculus. Specific emphasis will be given to the mathematics of noise. Basic statistics, data interpretation and probability are included.

NOISE SOURCES 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A practical review of the sources of noise, including a study of industrial noise, airport noise, impulsive noise and property line noise, with emphasis on identification and control.

PHYSICS I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory session per week)

An introduction to basic physics.

PHYSICS II (Noise Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

A continuation of Physics I with emphasis on sound transmission, wave action, decibal interpretation, octaves and their governing principles.

POLLUTION ABATEMENT (Noise Option) 3 hours
(3 fifty minute classroom sessions per week)

A general examination of pollution abatement in the areas of air, land and water. Special emphasis will be given to the factors involving noise abatement and control.

PRACTICAL COMPUTER APPLICATION 3 hours
(3 fifty minute classroom sessions per week)

The practical application of computerization as it pertains to data gathering, retrieval, utilization, and continuous programmed monitoring.

PUBLIC RELATIONS AND COMMUNICATIONS 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local Government.

SAFETY 2 hours
(2 fifty minute classroom sessions per week)

A comprehensive study of the principles of safety, including an examination of the Occupational Safety and Health Act and its ramifications. Basic first aid techniques are also emphasized.

SLIDE RULE USAGE 2 hours
(2 ffity minute classroom sessions per week)

A general course on the use and application of the slide rule. Emphasis will also be given to the uses of the electronic calculator.

STATISTICS AND PROBABILITY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to statistics and probability, with emphasis on use, application and interpretation of data in the noise abatement field.

2 YEAR ASSOCIATE DEGREE IN PESTICIDE TECHNOLOGY
(Pesticide Specialist)

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Biology	3	4
Chemistry I	3	6
Mathematics I	3	3
Ecosystems	2	2
Total	14	

Second Semester	Credit Hrs	Class Hrs
Toxicology	2	4
Chemistry II (Pesticide Option)	3	6
Mathematics II (Pesticide Option)	3	3
Botany	3	4
Introduction to Pesticides	3	3
Total	14	

Third Semester	Credit Hrs	Class Hrs
Geology I	3	3*
Entomology	3	4
Agricultural Pest Control	3	3*
Pesticide Labeling and Identification	2	2
Public Relations and Communication	2	2
Laboratory Instrumentation & Technique	2	6
Total	16	

Fourth Semester	Credit Hrs	Class Hrs
Equipment Operation and Maintenance	3	6
Structural Pest Control	3	3*
Environmental Regulations (Pesticide Option)	2	2
Agricultural Science & Practice	3	3
Pollution Abatement (Pesticide Option)	3	3
Safety and First Aid	2	2
Total	16	

Summer Internship

Six weeks of on-the-job training in commercial or agricultural pesticide application, or in government operations.

* Supplemented by one eight hour Saturday field trip during the semester.

Note: Successful completion of the summer internship will result in the granting of 4-6 credit hours towards completing graduation requirements.

Pesticide Technology
Course Descriptions

AGRICULTURAL PEST CONTROL 3 hours
(3 fifty minute classroom sessions supplemented by 1 eight hour field exercise during the semester)

A study of agricultural pests and their control. In addition to control through use of pesticides, attention will be given to alternate controls, e.g., crop rotation, resistant strains and importing natural enemies.

AGRICULTURAL SCIENCE & PRACTICE 3 hours
(3 fifty minute classroom sessions per week)

A study of current agricultural science and practices. Emphasis will be given to crop rotation, mechanization, hybrid strains, fertilizers and seasonal time frames.

BIOLOGY 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

An introductory course in general biology with supportive laboratory practice.

BOTANY 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

An introduction to plant life, its structure, growth and classifications. Emphasis will be given to agricultural and ornamental plants.

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory technique.

CHEMISTRY II 3 hours
(2 fifty minute classroom sessions and 2 hour laboratory sessions per week)

A continuation of Chemistry I with a detailed examination of chemistry, carbon chains, pesticide compounds and reactions. An introduction to laboratory analysis is recommended.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENTOMOLOGY 2 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

A basic biological study of insects, their characteristics and habitats. Specific attention will be directed to those insects, both agricultural and domestic, which characteristically impose an economic or social hardship on society.

ENVIRONMENTAL REGULATIONS (Pesticide Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing pesticides including an examination of those regulations pertaining to other pollution control and abatement fields.

EQUIPMENT OPERATION & MAINTENANCE 3 hours
(2 fifty minute classroom sessions and 1 four hour laboratory session per week)

A basic study of pesticide application equipment, commercial and agricultural, required in dry and wet application. Preventative maintenance, repair, and operation will be emphasized and supported by practical hands-on exercises.

GEOLOGY I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introductory course in the physical nature and history of the earth. Emphasis will be given to groundwater hydrology, percolation, soil permeability and run-off.

INTRODUCTION TO PESTICIDES 3 hours
(3 fifty minute classroom sessions per week)

An overview of pesticides, their history, application, prevalence, and future. The effect of pesticides on health and environment and their beneficial economic impact will be emphasized.

LABORATORY INSTRUMENTATION & TECHNIQUE 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A laboratory oriented course directed at the instrumentation and technique in pesticide analysis. Specific attention will be directed at hands-on experience in gas chromatography, infrared spectrometry and ultraviolet spectrometry.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the functions of addition, subtraction, multiplication, and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on concentrations, problem solving and pesticide related calculation .

PESTICIDE LABELING AND IDENTIFICATION 2 hours
(2 fifty minute classroom sessions per week)

A study of present requirements pertaining to pesticides labeling, including insecticides, fungicides and rodenticides. Product registration and Federal regulations will receive particular attention.

POLLUTION ABATEMENT (Pesticide Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, air and water. Special emphasis will be given to the factors involving pesticide control.

PUBLIC RELATIONS & COMMUNICATION 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State, and Local Government.

SAFETY AND FIRST AID 2 hours
(2 fifty minute classroom sessions per week)

A comprehensive study of safety, e.g., the Occupational Safety and Health Act, and first aid procedures. Special attention will be given to safe handling of pesticides and to first aid procedures.

STRUCTURAL PEST CONTROL 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of the principles and procedures involved in domestic pest control. In addition, attention will be given to alternate procedural controls, e.g., facility construction and elimination of food supply.

TOXICOLOGY 2 hours
(2 fifty minute classroom sessions and one two hour laboratory per week)

An introduction to the toxic effects of pesticides and other hazardous chemicals on the human environment.

* Supplemented by one eight hour Saturday field trip.

** Supplemented by two four hour practical exercises.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

2 YEAR ASSOCIATE DEGREE IN POTABLE WATER TREATMENT TECHNOLOGY

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Mathematics I	3	3
Chemistry I	3	6
Potable Water Treatment I	3	3*
Ecosystems	2	2
Total	14	

Second Semester		
Practical Electricity	2	2**
Mathematics II (Water Option)	3	3
Chemistry II (Water Option)	3	6
Potable Water Treatment II	3	3*
Microbiology (Water Option)	3	4
Total	14	

Summer Internship

Three weeks of on-the-job training at one or more water treatment facilities.

Third Semester		
Potable Water Treatment III	3	3*
Water Plant Operations I	3	3*
Public Relations and Communication	2	2
Hydraulics (Water Option)	2	2
Engineering Technology	3	3
Total	13	

Fourth Semester		
Potable Water Treatment IV	3	3*
Water Plant Operations II	3	3*
Pollution Abatement (Water Option)	3	3
Utility Management (Water Option)	2	2
Environmental Regulations (Water Option)	2	2
	13	

Summer Internship

Three weeks of on-the-job training at one or more water treatment facilities utilizing treatment processes encompassed within Potable Water Treatment III and IV.

* Supplemented by one eight-hour Saturday field and trip during the semester.

** Supplemented by two four-hour practical exercises.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Potable Water Treatment
Course Descriptions

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory techniques.

CHEMISTRY II 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A continuation of Chemistry I with a detailed examination of characteristics and identification of non-methane hydrocarbons, carbon monoxide, nitrogen, dioxide, sulfur dioxide and photochemical oxidants.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS (Water Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing the potable water supply field, including a general examination of those regulations pertaining to other pollution control and abatement fields.

HYDRAULICS (Water Option) 2 hours
(2 fifty minute classroom sessions per week)

A basic study of water hydraulics, with emphasis on stream flow, open conduit flow, head pressure, run-off and pump characteristics.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II (Water Option) 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on algebra and basic calculus. Calculations and problem solving as they pertain to the potable water treatment field will be emphasized.

MICROBIOLOGY (Water Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

Basic microbiology with emphasis on waterworks bacteriology, e.g., aquatic organisms, algae and coliform bacteria will will be emphasized as will testing procedures, identification and control.

POLLUTION ABATEMENT (Water Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, pesticides, noise, potable water, and wastewater. Special emphasis will be given to the factors involving potable water treatment control.

POTABLE WATER TREATMENT I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to potable water treatment, including sources of water, communicable disease, water quality, sanitary protection and consumer demand.

POTABLE WATER TREATMENT II 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Potable Water Treatment I with emphasis given to pumpage, storage, distribution and chemical feeding.

POTABLE WATER TREATMENT III 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Potable Water Treatment II with emphasis on filtration, aeration and filtration and ion exchange softening.

POTABLE WATER TREATMENT IV 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Potable Water Treatment III with special emphasis on the treatment processes of coagulation, sedimentation and lime softening.

PRACTICAL ELECTRICITY 2 hours
(2 fifty minute classroom sessions per week supplemented by 2 four hour practical exercises during the semester)

An introduction to electrical theory, with emphasis on developing a working knowledge of wiring, electrical troubleshooting, circuitry, single phase, three phase and loading.

PUBLIC RELATIONS AND COMMUNICATIONS 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

UTILITY MANAGEMENT (Water Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of the principles in water utility management, including personnel administration, financial planning, rate structuring, amortization and purchasing.

WATER PLANT OPERATIONS I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of water system instrumentation, controls, preventative maintenance, record keeping and the Occupational Safety and Health Act. The field trip should be conducted at a fully automated water treatment facility.

WATER PLANT OPERATIONS II 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Plant Operations I emphasizing water treatment plant waste disposal, cross connection control, corrosion control, and advanced water treatment technology, e.g., reverse osmosis, ozonation, granular activated carbon.

2 YEAR ASSOCIATE DEGREE IN POTABLE WATER/WASTEWATER TREATMENT TECHNOLOGY

(Water/Wastewater Treatment Technician)

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Mathematics I	3	3
Chemistry I	3	6
Potable Water Treatment I & II	4	4*
Ecosystems	2	2
Total	15	

Second Semester

Mathematics II (Water/Wastewater Option)	3	3
Chemistry II (Water/Wastewater Option)	3	6
Potable Water Treatment III and IV	4	4*
Microbiology (Water/Wastewater Option)	3	4
Practical Electricity	2	2**
Total	15	

Summer Internship

Three weeks of on-the-job training at one or more water treatment facilities.

Third Semester

Wastewater Treatment I and II	4	4*
Hydraulics (Water/Wastewater Option)	2	2
Engineering Technology	3	3
Public Relations and Communication	2	2
Water/Wastewater Plant Operations I	3	3*
Total	14	

Fourth Semester

Wastewater Treatment III and IV	4	4*
Utility Management (Water/Wastewater Option)	2	2
Environmental Regulations (Water/Wastewater Option)	2	2
Pollution Abatement (Water/Wastewater Option)	3	3
Water/Wastewater Plant Operations II	3	3*
Total	14	

Summer Internship

Three weeks of on-the-job training at one
or more wastewater treatment facilities.

* Supplemented by 1 eight hour Saturday field trip during the semester.

** Supplemented by two four hour practical exercises.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Potable Water/Waste Water Treatment
Course Descriptions

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory techniques.

CHEMISTRY II 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A continuation of Chemistry I with a detailed examination of characteristics and identification of non-methane hydrocarbons, carbon monoxide, nitrogen, dioxide, sulfur dioxide and photochemical oxidants.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENCLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS (Waste/Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing air pollution, including a general examination of those regulations pertaining to other pollution control and abatement fields.

HYDRAULICS (Waste/Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

A basic study of water and wastewater hydraulics, with emphasis on stream flow, open and closed conduit flow, Head pressure, run-off, pump characteristics, and flow measuring devices, e.g., flow meters, weirs, parshall flume, venturi meters.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on practical application as it relates to water and wastewater operation, e.g., chemical feed rates and dosages, volumes, flow calculations, plant loading capacity and problem solving.

MICROBIOLOGY (Water/Wastewater Option) 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

Basic microbiology with emphasis on water and wastewater bacteriology, e.g., coliform bacteria, algae (aerobic and anaerobic), and aquatic organisms will receive attention with extensive coverage in testing, identificaion and control.

POLLUTION ABATEMENT (Water/Wastewater Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, pesticides, noise, potable water, and wastewater. Special emphasis will be given to the factors involving water/wastewater control.

POTABLE WATER TREATMENT I & II 4 hours
(4 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to potable water treatment with a specific study of sources of water, communicable disease, water quality, sanitary protection, consumer demand, pumpage, storage, distribution and chemical feeding.

POTABLE WATER TREATMENT III & IV 4 hours
(4 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Potable water Treatment I & II with specific emphasis on filtration, aeration and filtration, ion exchange softening, coagulation, sedimentation and lime softening.

PRACTICAL ELECTRICITY 2 hours
(2 fifty minute classroom sessions per week supplemented by 2 four hour practical exercises during the semester)

A fundamental introduction to electrical theory, with emphasis on developing a working knowledge of wiring, electrical troubleshooting, circuitry, single phase, three phase and loading.

PUBLIC RELATIONS AND COMMUNICATION 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

UTILITY MANAGEMENT (Water/Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of the principles in water and wastewater utility management, including personnel administration, financial planning, rate structuring, amortization and purchasing.

WASTEWATER TREATMENT I & II 4 hours
(4 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to wastewater treatment including terminology, preliminary treatment, e.g., comminutors, bar screens, grit chambers, pre-aeration, and primary treatment, e.g., septic tanks, two-story tanks, sedimentation tanks and chemical treatment.

WASTEWATER TREATMENT III & IV 4 hours
(4 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Wastewater Treatment I & II with emphasis on secondary treatment, e.g., trickling filters, activated sludge, contact aeration, sand filtration, stabilization ponds, and chlorination, sludge treatment and sludge disposal.

WATER/WASTEWATER PLANT OPERATIONS I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of water system instrumentation, controls, preventative maintenance, and record keeping, including parallel presentations covering the wastewater treatment field. Additional emphasis will be placed on vocational safety, e.g., the Occupational Safety and Health Act, and standard first aid practices. The eight hour field trip should be conducted at water and wastewater treatment facilities employing extensive automation equipment.

WATER/WASTEWATER PLANT OPERATIONS II 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Water/Wastewater Plant Operations I emphasizing water treatment plant waste disposal, cross connection control, corrosion control, and advanced water treatment technology, e.g., reverse osmosis, ozonation, and wastewater sludge digestion gas, industrial waste, plant loading and proper wastewater treatment selection.

2 YEAR ASSOCIATE DEGREE IN
RADIATION TECHNOLOGY
(Radiation Specialist)

First Semester	Credit Hrs	Class Hrs
Chemistry I	3	6
Mathematics I	3	3
Physics I	3	4
Ecosystems	2	2
Radiobiology	3	4
Total	14	

Second Semester	Credit Hrs	Class Hrs
Public Relations and Communication	2	2
Mathematics II (Radiation Option)	3	3
English Composition	3	3
Environmental & Radiological Health Physics	3	4
Radiation Detection	3	3
Total	14	

Summer Internship

Three weeks of on-the-job training with a State, Federal, or local government agency or private industry in radiation monitoring and detection.

Third Semester	Credit Hrs	Class Hrs
Clinical Radiology	3	3*
Pollution Abatement (Radiation Option)	3	3
Radiation Instrumentation	3	6
Radiation Safety	3	3
Nuclear Reactors	3	3*
Total	15	

Fourth Semester	Credit Hrs	Class Hrs
Processing & Disposal of Nuclear Waste	3	3*
Environmental Regulations (Radiation Option)	2	2
Radiation Inspection & Reporting	3	3
Radiation Engineering Design	3	3
X-Ray Technology	3	3*
Total	14	

Summer Internship

Three weeks of on-the-job training in a
clinical or industrial facility where
radiation control is a factor.

* Supplemented by one eight hour field trip during the semester to a clinical facility or industrial/governmental installation where radiation control practices are utilized or researched.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Radiation Technology
Course Descriptions

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to organic and inorganic chemistry with emphasis on the atomic structure of matter and on laboratory techniques.

CLINICAL RADIOLOGY 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to the use of X-rays and radiant energy as applied to medical diagnosis and disease treatment. Emphasis will be given to the history, present use and projected future of radiological technology. Additional emphasis will be given to the variable techniques and materials utilized in clinical radiology.

ECOSYSTEMS 3 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL AND RADIOLOGICAL HEALTH PHYSICS 3 hours
(2 fifty minute classroom sessions and one 2 hour laboratory session per week)

A continuation of Physics I, with practical attention to the physics of radiation. Emphasis will be given to nuclear terminology, e.g., neutrons, alpha and beta particles, radiation control regulations and the economic suitability of facilities utilizing radioactive materials.

ENVIRONMENTAL REGULATIONS (Radiation Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing the radiation field, including a general examination of the regulations pertaining to other pollution control and abatement fields.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)
A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II 3 hours
(3 fifty minute classroom sessions per week)
A continuation of Mathematics I with emphasis on algebra and calculus. Specific emphasis will be given to the mathematics of radiation. Basic statistics, data interpretation and probability will be included.

NUCLEAR REACTORS 2 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)
A basic introduction to nuclear fission and nuclear fusion, including an examination of the physical devices used in initiating and maintaining controlled nuclear reactions. Specific attention will be given to facility construction, internal controls, automation, protective devices and site orientation. Maintenance and monitoring requirements for nuclear facilities including safeguards and restraints essential to operation will also be examined.

PHYSICS I 3 hours
(2 fifty minute classroom sessions per week)
A basic introduction to general physics with emphasis on the fundamentals of nuclear physics.

POLLUTION ABATEMENT (Radiation Option) 3 hours
(3 fifty minute classroom sessions per week)
A broad technical coverage of pollution abatement/control in the areas of air, land and water. Emphasis will be given to the factors involving radiation control.

PROCESSING AND DISPOSAL OF NUCLEAR WASTES 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field exercise during the semester)
A practical study in handling, processing and disposal of nuclear waste. Specific attention is to be given to containers, labeling, and shipping, e.g., mode of shipment, safeguards, notification of authorities and permits. Interim storage and permanent disposal will be included, with attention given to the reclamation and restoration of nuclear materials.

PUBLIC RELATIONS AND COMMUNICATION 3 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

RADIATION DETECTION 3 hours
(3 fifty minute classroom sessions per week)

A practical study of the procedures and equipment used in radiation detection. Emphasis will be given to measuring radiation exposure through the use of chemical and thermoluminescent dosimeters. The field use and interpretation of Geiger counters will also be emphasized.

RADIATION ENGINEERING 3 hours
(3 fifty minute classroom sessions per week)

An overview of the engineering principles governing the design and construction of medical, academic, and industrial facilities devoted to or housing radioactive materials. Specific attention will be given to materials, protective design, security safeguards and operational restraints as they pertain to community oriented medical facilities. Atomic energy installations and those facilities doing atomic energy/radiation research will be studied. Facility automation, over-ride controls and monitoring/instrumentation equipment will also be examined.

RADIATION INSPECTION AND REPORTING 3 hours
(3 fifty minute classroom sessions per week)

A practical program directed at in-house or regulatory monitoring of those facilities housing radioactive materials, or those facilities utilizing radioactive equipment in medical treatment/diagnosis. Inspection frequency, reporting parameters and record keeping are emphasized. Attention will be given to the monitoring and inspection of radioactive materials in transit. Development of a hypothetical surveillance/monitoring program applicable for use in a governmental regulatory agency is the course capstone.

RADIATION INSTRUMENTATION 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A colloquium in the detection and measurement of radiation through the use of scientific instrumentation. Specific attention will be given to liquid scintillation counters, electron spin resonance spectrometers, ultraviolet spectrophotometers, ionization chambers, G.M. Tubes and NaI Crystals.

RADIATION SAFETY AND FIRST AID   3 hours
(3 fifty minute classroom sessions per week)

An overview of the Occupational Safety and Health Act, including instruction in general vocational safety practices. Emphasis will be given to safety as it pertains to the radiation field. An introduction to radiation sickness and its symptoms will be included. Practice in basic first aid and/or paramedical techniques is desirable.

RADIOBIOLOGY   3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory session per week)

A general introduction to basic biology including extensive study of radiation effects on living organisms. The characteristics of teletherapy, along with the properties of gamma rays and X-rays as they pertain to their interaction with matter is emphasized. Attention to the characteristics and use of radioisotopes in the medical field, including exposure limitations, will be required.

X-RAY TECHNOLOGY   3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of the practical uses of X-rays in medical diagnosis and treatment. Comprehensive coverage in facility distribution, e.g., dental clinics, hospitals, medical centers, operation techniques, technician safeguards, protective clothing and variations in equipment. The material effect of X-rays on photographic plates and fluorescent screens, along with tissue destruction capability through extended exposure are emphasized. The monitoring and handling of X-ray equipment will also be emphasized.

2 YEAR ASSOCIATE DEGREE IN
SOLID WASTE TECHNOLOGY
(Solid Waste Specialist)

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Solid Waste Mathematics	3	3
Solid Waste Chemistry	3	6
Solid Waste Treatment I	3	3*
Ecosystems	2	2
Total	14	

Second Semester		
Solid Waste Treatment II	3	3*
Geology I	3	3
Basic Accounting	3	3
Engineering Technology	3	3
Entomology	3	4
Total	15	

Summer Internship

Three weeks of on-the-job training at one or more solid waste management facilities (OJT with a government organization is also desirable).

Third Semester		
Solid Waste Treatment III	3	3*
Geology II	3	5
Cost Accounting	3	3
Heavy Machinery Operation/Maintenance	3	6
Utility Management (Solid Waste Option)	2	2
Total	14	

Fourth Semester		
Resource Recovery/Energy Conversion	3	3*
Environmental Regulations (Solid Waste Option)	2	2
Public Relations and Communication	2	2
Pollution Abatement (Solid Waste Option)	3	3
Closing a Sanitary Landfill	3	3*
Total	13	

Summer Internship

Three weeks of on-the-job training at one or more solid waste management facilities (OJT with a government organization is also desirable).

* Supplemented by 1 eight hour Saturday field trip.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Solid Waste Management
Course Descriptions

BASIC ACCOUNTING 3 hours
(3 fifty minute classroom sessions per week)
Introduction to accounting theory and procedures, including understanding the balance sheet and income statements, matching costs and revenues, working paper development and debit-credit relationships.

CLOSING A SANITARY LANDFILL 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)
A comprehensive examination of the regulatory and physical requirements associated with the closing of a landfill. Specific attention will include rat extermination, poisons and baits, extinguishing fires, cover materials, protecting the water quality and the ultimate use of the landfill.

COST ACCOUNTING 3 hours
(3 fifty minute classroom sessions per week)
A continuation of Basic Accounting with emphasis on the practical aspects of labor costs, cover material costs, machine operating costs and overhead costs.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)
A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)
An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)
A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENTOMOLOGY 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)
A basic introduction to entomology with emphasis on communicable disease, vector control, identification and the use and application of insecticides.

ENVIRONMENTAL REGULATIONS (Solid Waste Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State and Local regulations governing the solid waste management field, including a general examination of those regulations pertaining to other pollution control and abatement fields.

GEOLOGY I 3 hours
(3 fifty minute classroom sessions per week)

An introductory course dealing with the physical nature and history of the earth. Specific attention will be given to the geologic strata of the earth's surface and to the relationship between geology and hydrology.

GEOLOGY II 3 hours
(1 fifty minute classroom session and 1 two hour laboratory sessions per week)

A continuation of Geology I with emphasis on groundwater hydrology, percolation, soil permeability, and test borings. Laboratory exercises typifying these principles are essential.

HEAVY MACHINERY OPERATION/MAINTENANCE 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A comprehensive study, reinforced by practical shop exercises, of the theory, operation, and maintenance of heavy machinery. Preventative maintenance and equipment repair, including use of a broad array of shop equipment will be emphasized.

POLLUTION ABATEMENT (Solid Waste Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, air and water. Emphasis will be given to the factors involving air pollution control.

PUBLIC RELATIONS AND COMMUNICATION 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

RESOURCE RECOVERY/ENERGY CONVERSION 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of the technical and economic aspects of various resource recovery processes, to include incineration with heat recovery, pyrolysis, composting and materials recovery. Emphasis will be placed on the economic and technical aspects of energy conversion.

SOLID WASTE CHEMISTRY 3 hours

(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

An introduction to chemistry, organic and inorganic, with appropriate attention to standard laboratory techniques. Emphasis will be placed on heavy metals and potential leachates which may be associated with a sanitary landfill. Laboratory analyses and water quality parameters will also be studied.

SOLID WASTE MATHEMATICS 3 hours

(3 fifty minute classroom sessions per week)

A comprehensive review of the fundamental processes of addition, subtraction, multiplication, and division, including a basic introduction to geometry, algebra and equations. Problems dealing with landfill operations will be emphasized.

SOLID WASTE TREATMENT I 3 hours

(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to solid waste disposal including history, health related effects and current solid waste disposal practices.

SOLID WASTE TREATMENT II 3 hours

(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Solid Waste Treatment I with emphasis on site selection, e.g., demographic and physical acceptability, site acquisition and site design.

SOLID WASTE TREATMENT III 3 hours

(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Solid Waste Treatment II with emphasis on sanitary landfill operation, equipment, staffing, source separation, record and report keeping, safety and the Occupational Safety and Health Act.

UTILITY MANAGEMENT (Solid Waste Option) 2 hours

(2 fifty minute classroom sessions per week)

An overview of the principles of solid waste utility management, including personnel administration, financial planning, rate structuring, amortization and purchasing.

2 YEAR ASSOCIATE DEGREE IN WASTEWATER TREATMENT TECHNOLOGY
(Wastewater Specialist)

First Semester	Credit Hrs	Class Hrs
English Composition	3	3
Mathematics I	3	3
Chemistry I	3	6
Wastewater Treatment I	3	3*
Ecosystems	2	2
Total	14	

Second Semester		
Practical Electricity	2	2**
Mathematics II (Wastewater Option)	3	3
Chemistry II (Wastewater Option)	3	6
Wastewater Treatment II	3	3*
Microbiology (Wastewater Option)	3	4
Total	14	

Summer Internship

Three weeks of on-the-job training at one or more wastewater treatment facilities.

Third Semester		
Wastewater Treatment III	3	3*
Wastewater Plant Operations I	3	3*
Public Relations and Communication	2	2
Hydraulics (Wastewater Option)	2	2
Engineering Technology	3	3
Total	13	

Fourth Semester		
Wastewater Treatment IV	3	3*
Wastewater Plant Operations II	3	3*
Pollution Abatement (Wastewater Option)	3	3
Environmental Regulations (Wastewater Option)	2	2
Utility Management (Wastewater Option)	2	2
Total	13	

Summer Internship

Three weeks of on-the-job training at one or more wastewater treatment facilities utilizing the treatment processes encompassed within Wastewater Treatment III and IV.

* Supplemented by one eight hour Saturday field trip.
** Supplemented by two four hour practical exercises.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

WASTEWATER TREATMENT TECHNOLOGY
Course Descriptions

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory techniques.

CHEMISTRY II (Wastewater Option) 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A comprehensive study of the laboratory procedures pertaining to the analysis of wastewater. Emphasis will be given to the procedures used in testing solids, DO, COD, BOD, and relative stability. The areas of nitrogen, toxic metals, volatile acids and grease will also be examined.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS (Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing the wastewater treatment field, including a general examination of those regulations pertaining to other pollution control and abatement fields.

HYDRAULICS (Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

A basic study of fluids at rest and in motion. Particular attention should be given to open and closed conduit flow, total dynamic head, pump characteristics, and flow measuring devices, e.g., weirs, parshall flume, venturi meters.

MATHEMATICS I 3 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II (Wastewater Option) 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on algebra and basic calculus. Calculations and problem solving as they pertain to the wastewater treatment field will be emphasized.

MICROBIOLOGY (Wastewater Option) 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

Basic microbiology emphasizing wastewater bacteriology. Algae and aquatic organisms will receive considerable attention as will identification and control procedures.

POLLUTION ABATEMENT (Wastewater Option) 3 hours
(3 fifty minute classroom sessions per week)

An overview of pollution abatement in the areas of land, air and water. Emphasis will be given to the factors involving air pollution control.

PRACTICAL ELECTRICITY 2 hours
(2 fifty minute classroom sessions per week supplemented by 2 four hour practical exercises during the semester)

An introduction to electrical theory, with emphasis on developing a working knowledge of wiring, electrical troubleshooting, circuitry, single phase, three phase and loading.

PUBLIC RELATIONS AND COMMUNICATION 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

UTILITY MANAGEMENT (Wastewater Option) 2 hours
(2 fifty minute classroom sessions per week)

A general examination of the principles governing wastewater utility management, including personnel administration, financial planning, rate structuring, amortization and purchasing.

WASTEWATER PLANT OPERATIONS I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A comprehensive study of wastewater treatment instrumentation, controls, preventative maintenance, record keeping, safety and the Occupational Safety and Health Act. The field trip should be conducted at a fully automated wastewater treatment facility.

WASTEWATER PLANT OPERATIONS II 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Wastewater Plant Operations I with emphasis on sludge digestion gas, industrial wastes, plant loading and proper treatment selection.

WASTEWATER TREATMENT I 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An introduction to wastewater treatment including terminology and preliminary treatment, e.g., comminutors, bar screens, grit chambers, pre-aeration.

WASTEWATER TREATMENT II 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Wastewater Treatment I with special emphasis on Primary treatment, e.g., septic tanks, two-story tanks, sedimentation tanks and chemical treatment.

WASTEWATER TREATMENT III 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Wastewater Treatment II with special emphasis on Secondary treatment, e.g., trickling filters, activated sludge, contact aeration, sand filtration and stabilization ponds.

WASTEWATER TREATMENT IV 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

A continuation of Wastewater Treatment III with special emphasis on chlorination, sludge treatment and sludge disposal.

2 YEAR ASSOCIATE DEGREE IN ENVIRONMENTAL TECHNOLOGY
(General Environmental Technician)

First Semester	Credit Hrs	Class Hrs
Mathematics I	3	3
Chemistry I	3	6
English Composition	3	3
Potable Water Treatment	3	3*
Noise Abatement/Control	3	3*
Ecosystems	2	2
Total	17	

Second Semester	Credit Hrs	Class Hrs
Physics	3	4
Mathematics II	3	3
Chemistry II	3	6
Wastewater Treatment	3	3*
Solid Waste Technology	3	3*
Total	15	

Summer Internship

Three weeks each of on-the-job training at a water treatment facility, a wastewater treatment facility, and in noise abatement.

Third Semester	Credit Hrs	Class Hrs
Geology	3	4
Biology	3	4
Engineering Technology	3	3
Public Relations and Communication	2	2
Pesticide Technology	3	3*
Instrumentation	3	6
Total	17	

Fourth Semester	Credit Hrs	Class Hrs
Environmental Regulations	2	2
Air Pollution Technology	3	3*
Safety and First Aid	2	2
Equipment Operation and Maintenance	3	4
Practical Electricity	2	2
Computer Usage	3	3
Total	15	

Summer Internship

Three weeks of on-the-job training at a solid waste installation, an air pollution monitoring or control facility, and in pesticide regulation and/or application.

* Supplemented by one eight hour Saturday field trip during the semester.

Note: Successful completion of a summer internship will result in the granting of 2-4 credit hours towards completing graduation requirements.

Environmental Technology
Course Descriptions

AIR POLLUTION TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the air pollution abatement/control field, including history, present conditions, economics, monitoring and sampling and air pollution control techniques, e.g., electrostatic precipitators, SO_2 scrubbers, automobile emissions, general source identification, meteorology and data interpretation.

BIOLOGY 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

A basic introduction to the biological sciences including study in zoology, botany and entomology. Terminology, laboratory exercises and habitats are emphasized.

CHEMISTRY I 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A basic introduction to inorganic and organic chemistry with emphasis on laboratory techniques.

CHEMISTRY II 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

A continuation of Chemistry I with a detailed examination of characteristics and identification of non-methane hydrocarbons, carbon monoxide, nitrogen, dioxide, sulfur dioxide and photochemical oxidants.

COMPUTER USAGE 3 hours
(3 fifty minute classroom sessions per week)

A basic introduction to the use of computers in data collection, storage and analysis. Terminology, programming logic, computer capability, and retrieval as it pertains to the environmental field are emphasized, e.g., utility billing, computerized monitoring and evaluating hydraulic design.

ECOSYSTEMS 2 hours
(2 fifty minute classroom sessions per week)

A colloquium directed at the sociological relationship between man and his environment, with emphasis on audio-visual aids and guest lecturers.

ENGINEERING TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week)

An introduction to basic engineering science, with emphasis on design, blueprint reading, equipment equivalency and the development of specifications.

ENGLISH COMPOSITION 3 hours
(3 fifty minute classroom sessions per week)

A general review course in basic English composition with emphasis on the clarity and objectivity of expression necessary to technical report writing.

ENVIRONMENTAL REGULATIONS 2 hours
(2 fifty minute classroom sessions per week)

An overview of Federal, State, and Local regulations governing land, water and air pollution, including a general examination of those regulations pertaining to other pollution control and abatement related fields.

EQUIPMENT OPERATION & MAINTENANCE 3 hours
(2 fifty minute classroom sessions and 2 two hour laboratory sessions per week)

An introduction to equipment operation and maintenance supported by hands-on exercises. Attention will be directed to heavy equipment operation, maintenance, and repair and to the use of pesticide application equipment.

GEOLOGY 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

An introductory program dealing with the physical nature and history of the earth. Groundwater hydrology, percolation, soil permeability and geologic strata will be emphasized.

INSTRUMENTATION 3 hours
(2 fifty minute classroom lectures and 1 two hour laboratory session per week)

An overview of instrumentation as it pertains to the environmental fields. Gas chromatography, infrared spectrometry, ultraviolet spectrometry, colorimeters, and allied laboratory test equipment will be emphasized. Additional emphasis will be placed on continuous air monitoring equipment and on electronic sound equipment required in intensity measurement.

MATHEMATICS I 2 hours
(3 fifty minute classroom sessions per week)

A comprehensive review of the basic functions of addition, subtraction, multiplication and division, including an introduction to geometry, algebra and problem solving.

MATHEMATICS II 3 hours
(3 fifty minute classroom sessions per week)

A continuation of Mathematics I with emphasis on algebra and basic calculus. Calculations and problem solving as they pertain to the air pollution field will also be emphasized.

NOISE ABATEMENT/CONTROL 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the noise abatement/control field, including history, current situation, economics, regulatory trends and future trends. Emphasis will be placed on the practical aspects of noise measurement and monitoring, acoustics and the control of noise. Basic instrumentation and available equipment will receive attention.

PESTICIDE TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the pesticide control field, including history, present use and abuse, the economics of pesticide use and regulation, and known health effects. Attention will be given to the practical use of pesticides in agriculture, including mode of application and prevalence. Emphasis will be given to structural pesticide usage and domestic application. Labeling, safe handling and first aid will be included.

PHYSICS 3 hours
(2 fifty minute classroom sessions and 1 two hour laboratory session per week)

An introduction to general physics, with emphasis on energy conversion, sound, wave action and thermodynamics.

POTABLE WATER TREATMENT 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the potable water treatment field. Emphasis will be placed on water treatment unit processes, e.g., chemical feeding, filtration, aeration and filtration, ion exchange softening, lime softening, purification, distribution systems, pumpage, storage and water quality. Additional emphasis will be given to laboratory analyses, preventative maintenance, water utility management and record keeping.

PRACTICAL ELECTRICITY 2 hours
(2 fifty minute classroom sessions per week)

A fundamental introduction to electrical theory, with emphasis given to developing practical working knowledge of wiring, electrical troubleshooting, circuitry (single and three phase) and electrical overloading.

PUBLIC RELATIONS AND COMMUNICATION 2 hours
(2 fifty minute classroom sessions per week)

A multi-discipline course directed at improving competence in written and oral communication and public relations skills as they pertain to Federal, State and Local government.

SAFETY AND FIRST AID 2 hours
(2 fifty minute classroom sessions per week)

A comprehensive study of the principles of safety, including the Occupational Safety and Health Act and the implications of its enforcement. Additional attention will be given to emergency care and first aid technique, supplemented by practical exercise.

SOLID WASTE TECHNOLOGY 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the solid waste field, with emphasis on landfill operation, resource recovery and energy conversion, landfill management and record keeping and closing of a sanitary landfill. The history of solid waste disposal, projected future need and technology and the health problems associated with solid waste disposal will also be examined.

WASTEWATER TREATMENT 3 hours
(3 fifty minute classroom sessions per week supplemented by 1 eight hour field trip during the semester)

An overview of the wastewater treatment field. Emphasis will be placed on wastewater treatment unit processes, e.g., preliminary treatment, primary treatment, secondary treatment, and tertiary treatment. Emphasis will also be given to laboratory analyses, preventative maintenance, wastewater utility management and record keeping.

RECOMMENDATIONS TO THE BOARD OF ILLINOIS PUBLIC HIGHER EDUCATION

It should be pointed out that the following are recommendations made to the Illinois Board of Higher Education and are the consequence of research and investigation by the National Field Research Center. They are not in any way to be construed as directives to either the Illinois Board of Higher Education or the Illinois Community College Board. Based on National Field Research Center data gathered during the course of this project, these recommendations are offered as an additional perspective which might serve to complement Illinois environmental planning efforts at the community college level.

1. Establish an Environmental Education Advisory Council (or its equivalent) to effect, as appropriate, centralization and standardization of environmental education within the Illinois Public Community College system. Although the Council membership and responsibility can be defined internally, it is recommended that representation be given the Illinois Board of Higher Education, the Illinois Community College Board, the Illinois Environmental Protection Agency, the Illinois Department of Public Health, and the Illinois Department of Agriculture. In addition, it is recommended that an active liaison be established between the Advisory Council and the U.S. Environmental Protection Agency, the Illinois Department of Labor, the U.S. Department of Labor, the Illinois Municipal League, the Illinois Institute for Environmental Quality, the Illinois Manufacturer's Association, professional environmental organizations and the Offices of the Governor of the State of Illinois.

2. Make full use of Advisory Council recommendations as they pertain to environmental curricula, program distribution, course nomenclature and content as well as Associate Degree/Certificate requirements.

3. Require of the Advisory Council that it remain cognizant of manpower needs within each environmental vocation through active, open communication with affiliate organizations, industry and government.

4. Develop and adopt, with the advice of the Advisory Council specific environmental Associate Degree/Certificate programs leading to the "Specialist" designation for participants who complete requirements.

5. Develop and adopt, with the advice of the Advisory Council, Associate Degree/Certificate programs encompassing two or more environmental vocations, culminating in the "Technician" designation for participants who complete requirements.

6. Develop and adopt, with the advice of the Advisory Council, Associate Degree/Certificate programs interrelating both the vocational needs and the licensing/certification needs of each environmental field.

7. Offer, with the advice of the Advisory Council, appropriate Associate Degree/Certificate programs in specific geographic areas which demonstrate clear environmental and employment opportunities.

8. Offer, with the advice of the Advisory Council, supplemental vocational core courses in those geographic areas which may not presently support full environmental Associate Degree/Certificate programs.

9. Solicit and utilize, where practical, core course instructors who have accrued field experience in specific environmental areas.

10. Develop, at the Community College level, an active relationship with industry, municipalities and local government which will provide mechanisms for practical hands-on student participation, field observation and short term internship.

11. Develop, with the advice of the Advisory Council, an active relationship with State/Federal Governmental agencies which will provide mechanisms for practical hands-on student participation, field observation and short-term internship.

12. Fund, equip, and staff, under the auspices of the Advisory Council, one or more specialized mobile testing/monitoring vans for statewide use by participating Community Colleges.

13. Annually request a summary report from all participating Community Colleges which documents the number of program participants, student recommendations and program/course evaluations.

14. Conduct, where practical, post graduation employment surveys of program participants and their employers to determine program/course viability.

15. Annually review, with the assistance of the Advisory Council, program/course distribution, content, or utilization, and update training systems as appropriate.

CONCLUSION

The data gathered during this phase of the study revealed that, while nearly all Illinois public community colleges offer programs and courses in environmentally related fields such as agricultural sciences and mechanics, auto mechanics and horticulture, none, with the exception of the more than twenty offering associate degree or certification oriented programs in water/wastewater technology, have comprehensive programs in seven pollution control and abatement disciplines considered by this study.

The preceding does not suggest that Illinois public community colleges or other state educational bodies have been remiss in meeting or anticipating environmental needs; however, the implications of existing and forthcoming mandates having a direct impact on environmental pollution cannot be denied, and will be an important factor in post-secondary vocational/technical curricular development of environmental protection programs. Future community college environmental protection programs ought to anticipate the ramifications of a full-scale federal, state and local effort to not only combat but to abate the ever growing magnitude of environmental pollution. Full scale enforcement will mean a rapidly growing demand for technicians trained up to and including the associate degree level to supplement on-going field operations and laboratory research and to fill new positions created by more sophisticated technology. There will also be a greater need for advanced training to upgrade present skill levels and to cross train individuals into environmental fields.

Employment projection figures compiled for the seven major pollution control areas during the first two phases of this project suggest an employment growth in the technical skill areas of nearly thirty percent by 1980. Growth in such areas as hazardous materials and resource recovery/energy conversion may be even greater. With these figures in mind, then, there can be little doubt that the community college, with its community oriented diversity, will play a vital role in improving the quality of the environment.

Local training and employment activities are important to a particular community college district, but these activities must be interfaced with regional activities and thus with statewide and federal policies to achieve common national goals. To this end, there is a very real need for a comprehensive and coordinated statewide strategy for environmental education. The key to enhancing and complementing existing and anticipated efforts must be an ongoing, cooperative resolve by all federal, state and local agencies, as well as industry, to carry out the environmental mandates set forth by legislation. One such option for developing the machinery necessary to opening and establishing the linkages for a joint state-wide effort has been previously outlined.

As a futher complement to a state strategy, Illinois might authorize, within each community college district, an environmental resource center especially designed to meet the environmental needs of the district which the college serves. Among a variety of public services, the center could, with films, information packets, lectures, workshops, and local tours, underscore the importance of environmental awareness. The center might also provide technical assistance to the community at large, advise prospective students and offer training facilities for governmental and private organizations whose staff may need or wish to take courses for certification or skill upgrading. By offering needed environmentally related services and resources, the respective community college adds another dimension to its community service perspective, which, in turn, enhances community and district cooperation. No major construction would be necessary to create these centers as they could well emerge from existing resources; however, a more elaborate or extensive center might be the consequence of two or more contiguous districts joining forces to form a single center, or districts might combine with four year colleges and universities to form a regional center.

It cannot be denied that the by-products of our industrial system may well mount to the level of the unendurable. We already have numerous examples of the environmental damage brought on by mounting material and energy consumption to highlight our situation. We have the technology and the human resources already in place to combat future destruction. We need to mount programs to train and employ individuals in disciplines which will first contain, then reduce and finally eradicate the pollution which might well be the harbinger of an ecological disaster. We are not yet in the fire but there is smoke on the horizon. Finally, legislation and strategies are of vital importance but too frequently effect only a short-term amelioration of the problem, and the long-term, permanent effect will have to come at the local level, and more specifically, in comprehensive training and employment practices. And, it is more and more the community college which stands in the breach between the nation, the state and the work force. The federal government provides national policies, state and local agencies act to complement its mandates, and both enforce the laws, but only effective training and education carried out at the local level can achieve an environmental quality commensurate with American ideals.

Illinois Environmental Manpower Survey

INTRODUCTION

The material contained herein capsulizes the information and data contained in the six individual pollution control inventories conducted for Illinois. The format includes synopses of the manpower profiles, projections, growth and career potential for each of the areas under investigation. Growth projections are necessarily based on best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution control areas considered by this study are as follows:

Air Pollution

Noise Pollution

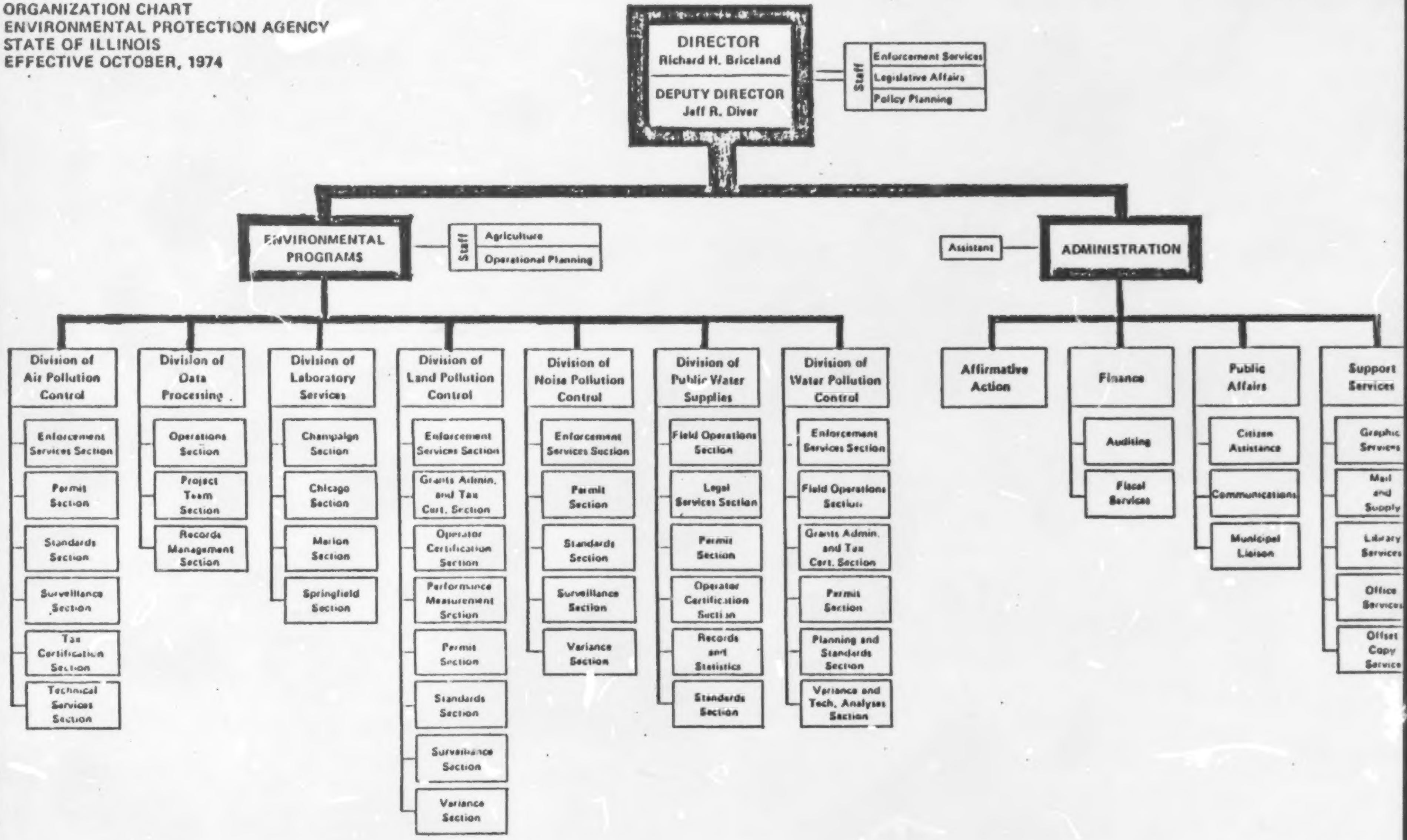
Pesticides

Public Water

Solid Waste

Waste Water

ORGANIZATION CHART
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS
EFFECTIVE OCTOBER, 1974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I. AIR POLLUTION

A. Manpower Profile

In view of the relative recency of concerted efforts in air pollution control and abatement, specific manpower figures are available only for federal and state agencies. However, the private sector has stepped up its activities, particularly in terms of meeting regulatory legislation. Many of the large industries have instituted in-house programs, usually carried out by engineering departments, in research, design and development of equipment necessary to meet air quality standards. In the public sector, most air pollution control activities are confined to monitoring, measuring and enforcement. The activities are carried out by highly trained, usually degreed engineers, chemists, and meteorologists. Some research is being done, but only where staffing, space and budget permit. IEPA presently employs over 120 people in the following areas:

TABLE 1

Current (1974) Illinois Air Pollution Control Manpower Level

Environmental Protection Engineers	69
Attorneys	6
Administrative/clerical	29
Meteorologists, Research Scientists, Laboratory Technicians and Chemists	8
Staffed Air Monitoring Units (Springfield, Collinsville, Joliet and Chicago)	12
TOTAL	124

IEPA efforts also include seventy-five mobile monitoring units staffed in many cases only temporarily. A single individual may be responsible for taking readings periodically at a number of sites. Additionally, the agency has 100 air sampling sites, usually read by local people. In U.S. EPA, Region V, there are approximately seventy-five engineers who work in air pollution related areas.

Generally speaking private industry may have as many as two thousand people involved in air pollution fields, and major industries occasionally have a staff of three or four individuals specializing in the air pollution problems unique to their particular operation. Industry also usually has an environmental coordinator whose responsibility is to insure that his employer is in compliance with regulatory mandates.

In the public sector, the Illinois Department of Vocational Technical Education (DVTE) in cooperation with participating community colleges sponsored an auto emission control program for more than 4,000 automobile mechanics from 1972 to 1974, but there has been no effort to reinstitute this Office of Education funded program.

B. Manpower Projection

Because of the nebulous nature of the available information, any effort to develop projections at this point in time would exceed the bounds of even speculation, especially where the private sector is concerned. Sources in the field do suggest; however, that the job market should sustain an annual five percent growth over the next few years.

C. Training and Certification

U.S. EPA has scheduled five seminars (2-4days) for Illinois in FY 1975. IEPA has a training program for smoke readers (½ day) which is completed by about sixty people a year. They also have informal, intra-agency training sessions for staff. The city of Chicago trained fifteen city employees to man five inner city auto emission control stations, but this program has been discontinued. The most extensive effort appears to be the program of the Illinois DVTE to train and upgrade automotive mechanics and servicemen in the skills necessary to repairing and maintaining automobile emission systems. Under Office of Education contracts (FY 1972-1974), DVTE trained nearly seventy-five instructors, who, in turn trained 4,191 mechanics during 247 eight hour seminars at eighty-five service institutions in sixty-two different cities. After the program was terminated in 1974, DVTE sought to have courses in emission control instituted at a number of community colleges, but most were poorly attended and passed into the realm of the occasional, informational course. The bulk of the other training is done at the senior academic institutions and is such that the air pollution control courses are offered as an adjunct to the engineering disciplines.

D. Career Potential

Air pollution control career opportunities, as previously indicated, are expected to develop at about five percent annually. The positions will be at the four year degreed or higher levels for the most part. On the other hand increasing public concern, new technology and most important, relaxed budgetary restrictions could well bring about a greater need for people trained in vocational/technical skill areas. At the the present time the most attractive positions appear to be with private industry, but it is doubtful that private employers require less than considerable engineering experience or degree level education. It would appear, then, that the career potential in air pollution control is presently rather restricted, not only from the evidence. but from the limited number of recognized positions listed in the following:

TITLE	DOT
Radiation Monitor	199.187-010
Air Analyst (Air Tester)	012.281-010
Meteorologist	025.088-014
Industrial Health Engineer	012.188-034
Industrial Hygienist	079.181-010
Automobile Mechanic's Assistant	620.884-010
Automobile Mechanic	620.281-014
Automobile Service Mechanic	620.381-014
Smoke Tester	012.281-014

II. NOISE POLLUTION

A. Manpower Profile

Even more recent than air are the efforts directed towards noise control, despite the fact that state legislation is contemporary with that of the other pollution areas. At the present time, the bulk of noise control and abatement activities are carried out by people with rather sophisticated training in physics, chemistry, acoustics, audiology and related engineering fields. Their tasks are generally confined to monitoring and control of environmental noise levels. Several universities and a few laboratories in private corporations where high noise levels are a significant factor in their operation, conduct a limited amount of research in such noise related fields as physics and acoustics. Research by state and federal agencies has been limited by either a lack of specifically trained staff, space or the legislative machinery which would demand more extensive efforts. Still, it is expected that increased public awareness will bring about increased activity. When this study was undertaken, it was estimated by IEPA that there were about 300-500 people involved statewide in noise. This figure included state/federal agencies, about twenty consultant firms and the 170 Illinois members of the National Acoustical Society. Nearly all the people in this figure are degreed and experienced specialists (scientist/engineers). There are thirty-five people in the IEPA noise division, withstanding clerical, they are engineers, administrators and attorneys.

B. Manpower Projection

The extended and sophisticated training presently necessary to the field along with the relative newness of noise pollution control as a unique profession have limited staffing levels and have kept growth at a minimum. The variety of noise control efforts, e.g. number of technical disciplines involved, has contributed to the uniqueness of noise specialists, in addition to making their salaries disproportionately high where there is an employment demand (private industry). In light of the above and the fact that there simply is little available information regarding manpower population, no effort was made to speculate about the future of noise control. Circumstances at present suggest that the field ought to develop in three ways: 1) A gradually growing cadre of professionals (three to five percent annually according to IEPA) working in control, abatement and research. 2) A similarly growing number of teachers capable of teaching in the noise field at all levels (vocational/technical, undergraduate/graduate). 3) A fairly rapidly growing number of individuals trained at technical levels to work in monitoring and enforcement.

C. Training and Certification

Since a high degree of specific and scientific training is integral to noise control, most preparatory work is done by the four year and graduate institutions. Limited training is conducted by consultant firms which are called upon by public and private agencies to conduct irregular in-house training sessions in methodology and monitoring. A few community colleges offer occasional informational courses in general environmental control, but rarely is a course offered which is in its entirety devoted to noise control. A four year or advanced degree in engineering, physics, and acoustics appears to be the primary requisite to entering noise control and abatement. Still, if legislative mandates are to be carried out, there will have to be an extensive technical training effort for all state and local law enforcement agencies. Though training need not be lengthy, it will certainly have to be wide spread and a part of an on-going refresher or update program in noise control and abatement practices.

D. Career Potential

Further regulation and enforcement of existing noise control laws will necessitate development of particular courses and programs (up to two years) leading to careers which will complement the work of the specialists already in the field. Careers as noise technicians or noise specialists should develop in the near future. There will, of course, be a continuing need for university trained scientists, researchers and administrative personnel. Careers in both the public and private sectors are expected to expand at a similar pace (three to five percent annually, IEPA estimate), although more attractive salaries will likely be found in the private sector.

III. PESTICIDES

A. Manpower Profile

The manpower inventory in Illinois pest control training and employment is difficult to assess accurately for several reasons. 1) Regulations mandating registration and certification of all individuals and companies utilizing pesticides have yet to become systemized into training-certification programs. 2) No information has been made available which reveals the staffing levels of the numerous private concerns engaged in pest control and abatement because company officials believe that to make public such information would place them at a disadvantage with respect to their competitors. 3) There are more than 123,000 farmers in Illinois, the majority of whom are engaged in some form of pesticide application with the number certified presently unknown. 4) Unknown numbers of nurseries, landscapers, state, county and local health agencies, along with the Department of Agriculture and its numerous extension offices are all involved in pest control/pesticides activities. In view of the preceding, then, manpower figures are necessarily based on available information supplied by professionals working in the field.

B. Manpower Projections

In view of the preceding, particularly the fact that regulations requiring the registration and certification of operators/applicators have not as yet become local action plans for training-certification, no attempt was made to develop projections. However, it has been estimated that as many as 12,000 people might presently be involved in pest control activities. These individuals may be employed by a large extermination company, one of the petroleum companies or he/she may constitute the entire operation. State and federal agencies are estimated to have 745 people working in some aspect of pest control. With the foregoing in mind, the present employment situation approximates the following:

TABLE 2

Current (1974) Illinois Estimated Manpower Levels in Pesticides

Private Sector:	Owners/Operators/Applicators	12,000
Farmers:		123,000
Public Sector:	State Dept. of Public Health/ Extension Agencies/Department of Agriculture/Federal Government	745

Although factual staffing level information presently available is limited and highly tentative, interviews and surveys conducted in the public and private agencies revealed some interesting speculation about the field in general. Most agreed that the turnover rate for operators ran as high as forty percent, probably brought about by the $500-600/month salary and restricted professional upward mobility. Still it was estimated that the field might grow to two or three times its present size with and especially large influx in the private sector after 1976 when federal regulations becomes a real factor in the control and use of pesticides. Local, state and federal agencies anticipate little growth and sources in those offices expect staffing reductions in the future.

C. Training and Certification

The most significant developments will be the enforcement of the new federal regulations and guidelines, the Federal Insecticide and Rodenticide Act (FIFRA) and its amendments and State legislative mandates. The latter will require the training, examination and certification of all commercial and private applicators/operators (October, 1976). Present training is limited to one and two day seminars conducted across the state by the State Department of Agriculture. These seminars provide the recipient with information necessary to his/her obtaining a custom applicator/operator's license. Illinois now issues licenses for the areas of: field crops, ornamental and turf, aquatic, right-of-way and mosquite. As of December, 1973 the Agriculture department had issued 2163 custom spray operator and 1756 custom applicator licenses to landscape nurseries, grain elevators, fertilizer, farm supply, extermination, chemical and oil companies. As federal EPA regulations become mandates, Illinois expects to train and examine individuals in seven additional areas: 1) demonstration (extension personnel, vo-ag, chemical commpany representatives, 2) regulatory (federal, state, county, township, municipal), 3) public health (federal, state, county, township, municipal), 4) livestock, 5) forest, 6) seed treatment, 7) structural, industrial, institutional, public health. There are at present no formal post-secondary programs leading to specific degrees in pest control, but again, future regulation will bring about the emergence of extended formal training programs up to and including four year and advanced degrees, although the bulk of the training will be accomplished at community colleges and other training facilities.

D. Career Potential

Specialized vocational-technical training for the pesticides/pest control field will become increasingly important as controls are enforced and a wider variety of options will be available to prospective trainees. Degreed and graduate personnel will still be needed in administrative operations and research capacities, but their growth will not be as dramatic as the less than degreed career fields.

TITLE	DOT
Biological Aide	049.384-010
Agronomist	040.081-014
Agricultural Engineering Technician	013.181-010
Agricultural Engineer	013.081-010
Entomologist	041.081-058

Aquatic Biologist	041.081-026
Horticulturist	040.081-046
Botonist	041.081-042
Sanitarians	079.118-014
Sanitary Engineers	005.081-046
Plant Pathologist	041.081-134
Chemical Laboratory Technician	002.281-014
Laboratory Tester	002.281-022
Analytical Chemist	002.081-014
Inorganic Chemist	002.081-034
Weed Control Supervisor	096.68-022
Weed Inspector	465.781-010
Chemical Engineer	008.081-014
Sanitary Inspector	168.287-094
Health Physicist	079.021-010
Pest Control Representative (Structural)	299.287-014
Termite Treater Helper	389.888-026
Termite Treater	389.781-010
Air Plane Pilot (Agricultural)	196.283-010
Pest Control Worker (Scout)	465.381-010
Air Plane Pilot (Conservation)	180.168-010
Blight Control Foreman	465.137-010
Fumigator, Orchard	465.884-010
Laborer	465.887-018
Sprayer	465.887-022
Tree Girdler	465.887-026
Exterminator Supervisor	389.138-010
Fumigator	389.381-010
Exterminator	389.884-010
Fertilizer Foreman	559.138-022

IV. PUBLIC WATER

A. Manpower Profile

Illinois has approximatley 1700 municipal water supplies which are broken down into four classifications according to their respective type of treatment capability.
1) Coagulation, Lime Softening and Sedimentation.
2) Filtration, Aeration and Filtration or Ion Exchange.
3) Chemical Feeding (chlorination/fluoridation).
4) No treatment (pumpage, storage or distribution).
Plant staffing levels at these plants includes about 6000 operators, 2300 of who are certified. Each facility is obliged to have at least one certified operator of the corresponding or higher classification for a given plant. Generally, it is not mandatory that other staff be certified as operators, but an operation functioning with distinct organizational entities (e.g. treatment vs. distribution)

must have a certified operator in responsible charge of each function.

Operator certification is classified into four categories based on training and experience. A summary of the presently active certificates (source:IEPA) as of July, 1974. It should be noted that limited certificates will be phased out in the near future.

TABLE 3

Current (1974) Illinois Active Water Operator Certificate

CLASS	Limited Certificates	CLASS	Permanent Certificates
A	25	A	642
B	27	B	388
C	0	C	814
D	0	D	349
TOTAL	52	TOTAL	2193
		Total of all certificates	2245

B. Manpower Projection

Using the preceding table of certified operators as an index to develop manpower projections including new entry, upgrade and turnover (this represents about twenty-five percent of the total operator population), the following tables may be said to illustrate anticipated operator growth/decline by classification for 1975-1980. No estimates were made concerning individuals in managerial, research or unskilled positions as such was felt to be inordinately speculative.

Classifications "B" and "C" demonstrate a gradual, though consistent growth with a restricted movement upward from class "D" to higher classifications. Minimal turnover is anticipated at the higher levels, particularly "A" and "B" probably because once an individual accumulates the requisite training and experience, which is rather extensive, he/she is not likely to either relinquish the position or change professions unless it might be into an administrative capacity such as director or commissioner of public water supply. The "C" and particularly "D" classifications reflect a high incidence of turnover (attrition) due to low wages, an unwillingness to accrue the necessary experience or undergo the further training. Other factors contributing to the relative instability of the latter categories may be attributed to the failure of small municipalities to provide adequate job security or the fact that many operators are inundated by the number and variety of tasks they are obliged to perform.

TABLE 4

Illinois Public Water Manpower Projections for 1975-1980
Growth/Decline by Operator Classification (est.)

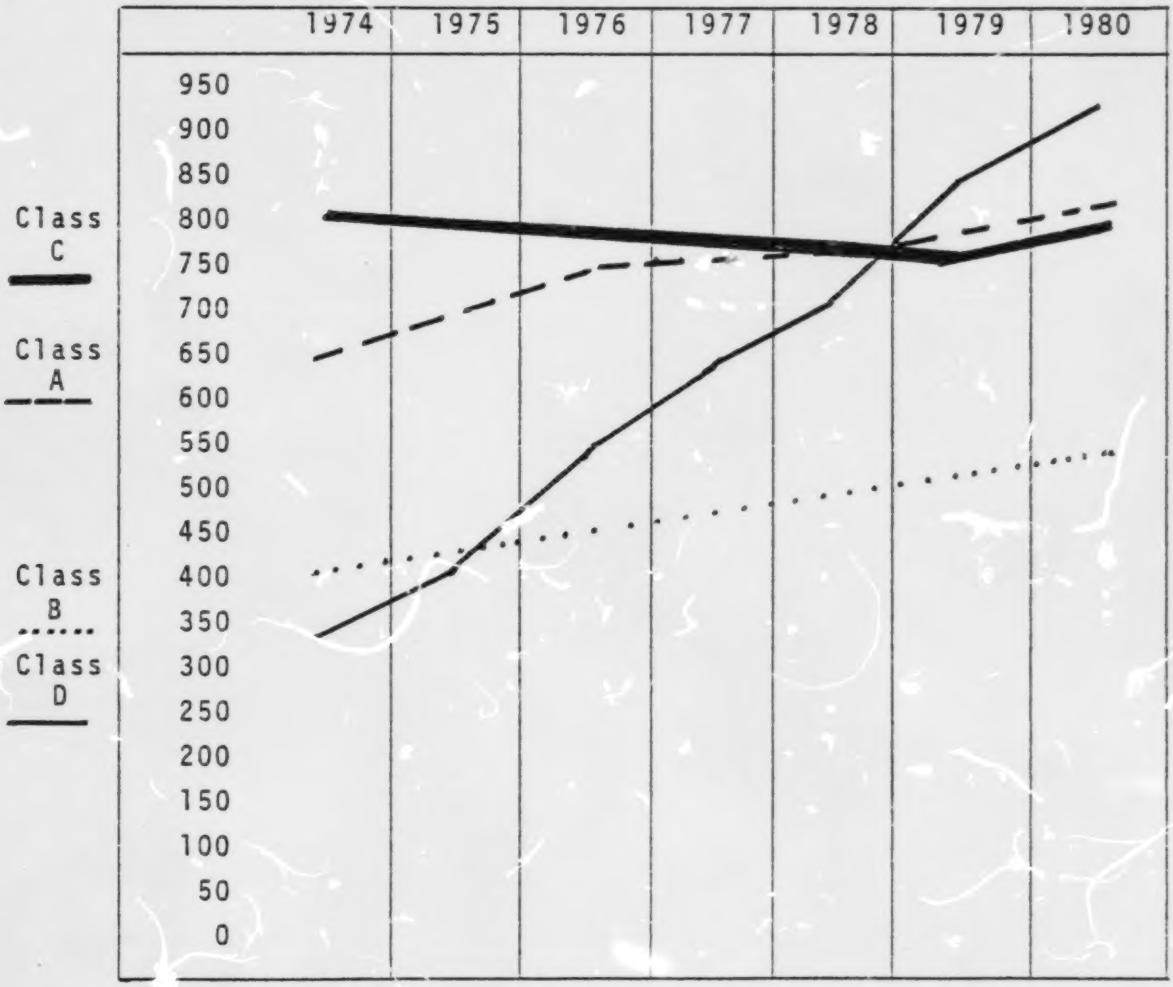


TABLE 5

Illinois Public Water Manpower Growth/Decline by Operator Classification 1975-1980 (est. numbers)

Class	1974	1975	1976	1977	1978	1979	1980
A	667	688	710	732	757	783	814
B	415	443	468	490	515	537	558
C	814	789	771	777	777	780	787
D	349	438	532	627	721	815	911
Total	2245	2358	2481	2626	2770	2915	3070
Increase	--	89	94	95	94	94	96
Total increase for all classifications							817
Total percent increase for all classifications							27

Withstanding local political and economic situations, public water supply is expected to grow by some twenty-seven percent. The most growth is anticipated in the "D" classification as those who elect to enter professions as operators will require certification Other classifications should remain fairly stable over the six year period exhibiting moderate overall growth, primarily through the upgrade process.

C. Training and Certification

Public water training is presently being carried out under the direction of IEPA, Division of Public Water Supply. They employ such methods as one/two day seminars, regional and state-wide conferences, correspondence courses and 10/16 week community college programs at ter community colleges. Through these programs, which involve more than 4000 man training hours, e.g. ten men/four hours equates to forty man hours, IEPA expects to reach more than 4000 individuals in FY1975. This figure may not be entirely accurate as one individual may be involved in one or all programs. A typical breakdown of those reached by a particular program, taken from FY 1973 IEPA records, is as follows:

Conferences	1,435
Community College Training	280
Seminars (1-2 day)	1,784
Correspondence Courses	500
Total	3,999

IEPA furnishes materials necessary to the short programs, including instructors, though they may be operators or equipment manufacturers' representatives. The community college programs are sponsored jointly by IEPA and the school; the schools supply materials and the agency provides course coordination.

D. Career Potential

Public water career opportunity is becoming increasingly restricted as further consolidation in favor of water conservancy districts takes place. The following occupational listing appears to suggest a great variety of career potential, but these classifications will occur only in larger sophisticated operations, and, as previously indicated the number of water supplies will diminish. And, it is expected that unique new careers will emerge only on a limited basis.

TITLE	DOT
Engineering	
Chemical Engineer	008.081-034
Chief Engineer (Waterworks)	005.168-010
Civil Engineer	005.081-014
Engineering Analyst	020.088-010
Hydraulic Engineer	005.081-026
Industrial-Health (Hygiene) Engineer	012.188-034
Operation-Research Analyst	020.088-022
Programmer (Engineering & Scientific)	020.188-030
Sanitary Engineer	005.081-046
Sewage Disposal Engineer	005.081-050
Stationary Engineer	950.782-054
Stationary Engineer (Apprentice)	950.782-058
Superintendent-Water and Sewer Systems	005.168-018
Supervisor (Waterworks)	005.188-010

General Management and Supervision

Commissioner (Public Works)	188.118-030
Economist	050.088-014
Electric-Motor Repairing Foreman	729.281-030
Foreman, Pumping Station	954.130-010
General Foreman	183.168-022
Incinerator Foreman	955.130-010
General Foreman (Incinerator Plant)	184.168-058
Laboratory Chief	976.131-014
Maintenance Foreman	891.138-014
Maintenance Mechanic Foreman	638.131-022
Maintenance Supervisor	184.168-062
Manager (Irrigation District)	184.118-038
Mechanical Maintenance Man-Foreman	638.131-030
Pipe Fitter Foreman	862.131-014
Plumber Foreman	862.131-022
Plumber Foreman, Maintenance	862.131-026
Pump Serviceman Foreman	630.131-010
Sewer Forman	851.138-010
Statistician, Applied	020.188-034
Superintendent (Building)	187.168-194
Superintendent Maintenance	189.668-030
Superintendent Sanitation (Environmental Scientist)	188.168-110
Superintendent (Transmission)	184.168-242
Superintendent-Water and Sewer System	005.188-010
Superintendent (Waterworks)	184.168-238
Supervisor (Waterworks)	005.188-010
Utilities and Maintenance Foreman	899.131-014
Watermaster	184.168-286
Water and Sewer Systems Foreman	862.138-018
Water Service Supervisor (Operator)	954.782-022

Inspection

Industrial Waste Inspector	168.287-054
Safety and Sanitary Inspector	168.268-038
Sanitary Inspector	168.287-094

Maintenance and Repair

Auto Mechanic	620.381-014
Electrical-Instrument Repairman	729.281-030
Electric-Motor Repairing Foreman	721.131-010
Electric-Motor Repairman	721.281-022
Grounds Maintenance Keeper	407.884-026
Hydrant-and-Valve Maintenance Man	862.884-026
Hydrant-and-Valve Setter	862.884-030
Incinerator Foreman	955.130-010
Instrument Mechanic Helper	710.884-078
Instrument Repairman	710.281-058
Instrument-Repairman Helper	710.884-082
Lubrication-Equipment Maintenance Man	630.381-022
Maintenance Foreman	891.138-014

Maintenance Man-Building	899.381-010
Maintenance Man Helper - Building	899.887-014
Maintenance Mechanic	638.281-022
Maintenance-Mechanic Foreman	638.131-022
Maintenance-Mechanic Helper	638.884-010
Maintenance Technician	638.281-026
Master Mechanic Maintenance	638.131-026
Mechanical-Maintenance Man	620.281-074
Mechanical Maintenance Man-Foreman	638.131-030
Meter Repairman	710.281-066
Meter Repairman Helper	710.884-086
Painter	740.887-026
Pipe Fitter Apprentice	862.381-062
Pipe Fitter-Maintenance	862.281-022
Pipe Fitter	862.381-050
Plumber	862.381-074
Plumber Apprentice	862.381-078
Plumber Foreman Maintenance	862.131-026
Plumber Maintenance	862.381-082
Pump Installer	630.884-022
Pump Serviceman	630.281-046
Pump Serviceman Foreman	630.131-010
Pump Serviceman Helper	630.884-026
Pump Station Operator	954.782-014
Technical-Maintenance Man	714.281-022
Treatment Plant Mechanic	630.281-070
Utilities and Maintenance Foreman	899.131-014
Water Meter Repairman	710.281-078
Water-Test Man	862.685-010
Water and Sewer Systems Foreman	862.138-018

Operations

Basin Operator (Waterworks)	954.885-010
Ditch Rider	954.782-010
Foreman Pumping Station	954.130-010
Incinerator Foreman	955.130-010
Incinerator Operator	955.782-014
Incinerator-Plant Attendant	955.884-010
Laboratory Chief	976.131-014
Pump Station Operator	954.782-014
River-Pump Attendant	954.855-014
Sewage or Water Plant Operator	954.782-018
Sewage Plant Operator	955.782-018
Sewage Plant Operator (Senior)	955.130-014
Turn Off-Turn-On Man	954.884-010
Water Treatment Plant Operator	551.885-206
Water-Meter Installer	954.884-014
Water Service Dispatcher	954.368-010
Water Service (Supervisor)	954.782-022
Water or Sewage Plant Operator	954.782-018

Watershed Tender (Waterworks)	954.782-030
Water Treatment Plant Operator	954.782-026

Operations Support

Bulldozer Operator	850.833-010
Dump-Truck Driver	902.883-010
Dump-Truck Driver (Off Highway)	902.883-014
Filter Bed Placer	954.887-010
Laborer Pipeline	862.887-026
Machine Operator	619.885-070
Pipe Cleaning Machine Operator	862.782-014
Pipe Cleaning and Priming Machine Operator	862.782-010
Pipe Fitter	862.381-050
Pipe Fitter Apprentice	862.381-062
Pipe Fitter Foreman	862.131-014
Pipe Fitter Helper	862.884-046
Pipe Fitter Welding	862.381-058
Pipe Wrapping Machine Operator	862.782-018
Pipe Line Worker	862.884-054
Plumber	862.381-074
Plumber Foreman	862.131-022
Plumber Helper	862.884-058
Power Shovel Operator	850.863-030
Pumpman	914.885-018
Pumpman Helper	914.887-014
Sewage Disposal Worker	955.887-010
Sewage Plant Attendant	955.885-010
Sewer Bottom Man	850.884-018
Sewer Foreman	851.138-010
Sewer Tapper	862.884-062
Tank Cleaner	891.887-022
Waste-Disposal Man	955.883-010
Water Filter Cleaner	954.887-014
Water Meter Installer	954.884-014
Water Service Dispatcher	954.368-010

Scientific

Biochemist	041.081-030
Biological Aide	049.384-010
Biologist	041.081-034
Chemical-Laboratory Technician	022.281-014
Chemist (Analytical)	022.081-014
Chemist (Inorganic)	022.081-034
Chemist (Organic)	022.081-042
Chemist (Physical)	022.081-046
Chemist (Water Purification)	022.281-018
Drainage-Design Coordinator	019.187-010
Entomologist	041.081-058
Geologist	024.081-018

Geophysicist (Hydrologist, Oceanographer)	024.081-038
Health Officer, Field (Epidemiologist)	168.168-030
Health Physicist	079.021-010
Hydrographer	025.288-010
Laboratory Chief	976.131-014
Laboratory Supervisor	022.168-014
Laboratory Tester	029.381-034
Meteorologist	025.088-014
Microbiologist or Bacteriologist	041.081-094
Operation-Research Analyst	020.088-022
Physiologist	041.081-118
Programmer (Engineering and Scientific)	020.188-030
Public Health Bacteriologist	041.281-010
Sanitarian (Environmental Scientist)	079.118-014
Statistician, Applied	020.188-034

Supportive Services

Administrative Assistant	169.168-014
Administrative Secretary	169.168-018
Billing Machine Operator	214.488-014
Bookkeeping Machine Operator	215.388-010
Clerk (General)	209.388-018
Clerk Typist	209.388-022
Coding Clerk	219.388-074
Stock Clerk	223.387-094
Telephone Operator Clerk	235.862-026

V. SOLID WASTE

A. Manpower Profile

Illinois has about 530 municipal and demolition landfills scattered throughout the state. It is estimated by sources in IEPA and landfill owners/operators that there may be more than 12,000 individuals employed in collection, disposal and resource recovery/energy conversion (RR/EC) at these sites (Chicago and the adjacent six county area may account for nearly fifty percent of the labor force). To bring the overall manpower situation into focus, the field was broken down into its three basic components of collection, disposal and RR/EC.

Collection is estimated to employ 9,240 people as chauffeurs, helpers and jumpers. This figure was developed by using Springfield (pop. 130,000), employing an average crew size of two for its forty trucks and about thirty people in management as an index for the entire state (11,000,000). There are approximately 2,124 people engaged in disposal activities at the 530 landfills. This figure assumes an average crew size of four. These positions might be owner/operator, weighmaster, equipment operator/mechanic, laborer, spotter, or materials handler. Crew size could be as high as fifteen and range to a single individual in a rural area. The RR/EC manpower level is believed to be approximately fifty, which represents individuals working full-time at some fifteen or sixteen landfills throughout the state where RR/EC tasks are being carried on. These activities may include materials handling/sorting or complex machine operation and maintenance. The estimate does not include private industry or the post-consumer efforts of volunteer or service organizations.

B. Manpower Projection

The overall estimate of the manpower situation in solid waste, including projected growth, turnover, new entry and upgrade, is reflected in the following table. The figures are not broken down by skill as one position frequently entails performing a variety of functions, e.g. a landfill operator/owner may serve as scale man, operator and mechanic. At other sites, specific jobs are difficult to identify since many individuals are simply hired off the street into any number of positions. In collection, projections are based on a straight line two percent annual growth rate and an annual turnover rate of five percent (replaced by new hirees). It is anticipated that the RR/EC field will exhibit an initial rapid growth period and then stabilize to an annual growth of five percent after 1975. According to IEPA, staffing levels in disposal should remain constant as about the same number who enter the field, all employment factors considered, will move into the RR/EC field. This shift in skill emphasis and training will be a consequence of forthcoming federal/state regulation and the expected intensification of RR/EC efforts.

TABLE 6

Total Illinois Solid Waste Manpower Projections

	1974	1975	1976	1977	1978	1979	1980
Collection	9240	9887	10,581	11,322	12,115	12,963	13,370
Disposal	2124	2124	2124	2124	2124	2124	2124
RR/EC	50	300	700	749	801	857	917

On the whole, comprehensive projections are difficult to formulate for several reasons. 1) Private employers are frequently reluctant to reveal their manpower structure because of the competitive nature of the business. 2) Intensified RR/EC activity will alter staffing levels significantly. 3) While the amount of solid refuse being generated will continue to increase, technology is expected to reduce the volume. 4) According to IEPA and local employers, a substantial segment of the labor force is simply hired off the street and work only parttime or temporarily at numerous tasks.

C. Training and Certification

Under present conditions, IEPA has indicated that with intensified RR/EC efforts, technical upgrade training programs in recovery and conversion fields will account for about eighty percent of the total anticipated labor force. Training for the remaining twenty percent will likely be conducted on site for new entrants by experienced owner/operators.

IEPA officials suggest that owner/operator certification is about a year away. At the present time, owner/operators are obliged to obtain an appropriate permit to operate a sanitary landfill. Formal examination is not yet required and permits are issued if the individual/company is able to meet the standards of operating a sanitary landfill, although operating landfills are subject to periodic inspections by authorized officials (IEPA, Public Health).

IEPA continues to offer one and two day seminars for owner/operators at selected sites across the state. These seminars, conducted by IEPA staff, review rules and regulations governing operation, explain new procedures and present manuals, lectures and films covering proper landfill operation, e.g. RR/EC, materials handling, landscaping and site reclamation. IEPA has trained 520 owner/operators by this method over the past two years. When this study was completed (1974), there were no known formal training programs at the vocational technical institutions or community colleges leading to degrees or certificates in a solid waste field, although several community colleges offer occasional courses which may have specific application for solid waste.

D. Career Potential

A variety of solid waste career options are apt to develop in light of advancing technology, more stringent regulations and increasing public awareness. A certain number of fields such as chemistry, metallurgy, hazardous waste management and engineering will continue to be a necessity in research and related fields, but the greater part of career training will be accomplished at the less than degreed level by the vocational technical institutions and community colleges. In addition, as the complexity of solid waste management increases, qualified personnel will be need to instruct in the technical areas of the discipline. Also, if it may be assumed that the profession will continue to grow and develop as an industry, there will be a growing need for systems analysts in production and administration. The ensuing list of occupations illustrates some of the existing options:

TITLE	DOT
Superintendent of Solid Waste	188.168-110
Engineer Aide (Helper)	620.884-034
Engineering Technician	007.181-026
Garbage Collection Foreman	909.138-014
Garbage Collector	909.883-010
Incinerator Plant Foreman	184.168-058
Incinerator Operator	955.782-014
Incinerator Plant Attendant	955.884-010
Landfill Disposal Assistant (Materials Handler)	929.887-050
Landfill Foreman	183.168-022
Scale Man (Weighmaster)	224.478-026
Solid Waste Management Assistant	169.168-010
Surveying Technician	018.687-010
Heavy Equipment Operator	424.883-010
Heavy Truck Operator	902.883-022

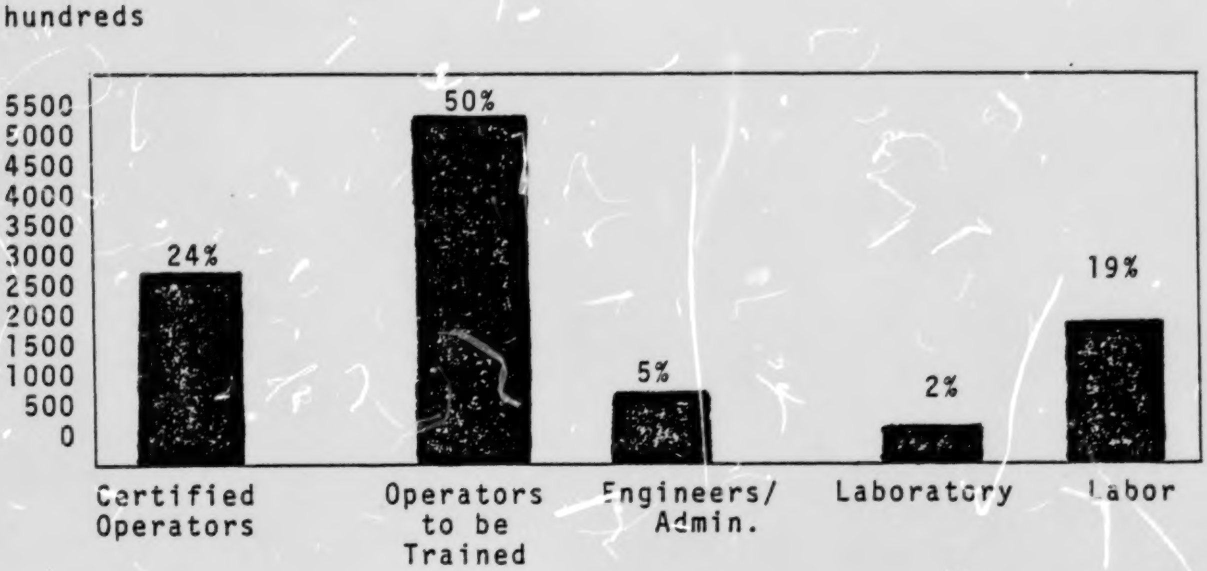
VI. WASTE WATER

Manpower Profile

It has been estimated by the Water Pollution Control Division of IEPA, that as many as 10,000 people may be employed at the some 2400 municipal and private treatment facilities in Illinois. Of these 2431 are certified operators (1974). Additional estimates suggest that there are about 200 degreed engineers working in research and administrative capacities and 500 college and university educated biologists, chemists and laboratory technicians currently involved in waste water treatment practices. Further reports from IEPA and site surveys agree there could be upwards of 5000 individuals now employed in the field who should be trained and certified. Along with an estimate nineteen percent of the total personnel figure working in labor/maintenance positions, the total manpower level is then brought to the level illustrated by Table 7.

TABLE 7

Current (1974) Illinois Waste Water Manpower Level (est.)



B. Manpower Projection

The basis for formulating staffing projections was the number of operators actually certified as of August, 1974 in all of the seven classifications (class size, temporary certificates, is due to be phased out and those holding class five certificates will be obliged to pre[illegible] for upgrade examinations). Overall growth is projected according to figures developed from IEPA certification records dating from 1969. A cumulative increase of twenty-two percent for all classifications is anticipated for the six year period. The previously depicted areas of laboratory, engineering and labor/maintenance were not considered as it was felt that such projections would involve unwarranted speculation, particularly in the high-turnover labor/maintenance category.

C. Training and Certification

Efforts in training and certification are expected to be broadened substantially beginning in FY 1975. With the assistance and cooperation of both U.S. EPA and IEPA the on-going programs at the sixteen Illinois community colleges will be expanded in the areas of curriculum and formalized operator training.

The new training facility at Southern Illinois University, Edwardsville, will serve to augment all phases of current training activities throughout the state. New IEPA legislation governing certification and classification will more closely define the necessary training guidelines as well as lending the field, by implication, a greater sense of professionalism. IEPA is further engaged in a wide sweeping program to optimize operational practices across the state through a series of management awareness seminars, instructor development, operator enrichment, collation of instructional aids and more effective program evaluation. To accomplish these ends a number of operations (300) and sites (150) will be selected and the project begun in FY 1975.

D. Career Potential

There are a number of positions both at the degreed and the vocational/technical training levels which are accessible to those entering the waste water treatment field. In most instances the titles are self-explanatory although specific duties will vary relative to the complexity and magnitude of the respective facility. The categories are broken down into degree and non-degree positions, although some overlapping will obviously occur.

DEGREE

Micro/Macro-Biologist

Chemist

Biologist (General)

Engineer

System Analyst

Administrator

NON-DEGREE

Certified Operator

Electrician

Mechanic

Equipment Operator

Clerical

Computer/Programming

Key Punch

Technical Assistant

Buildings and Grounds

Foreman

Laboratory Technician

(For a complete occupational listing, refer to the public water section.)

VII. CONCLUSION

From the information compiled during the course of the study, a number of conclusions may be made which generally characterize the situation in all six pollution control areas. Most significantly, data which will more precisely identify staffing levels, particularly in the less than degreed areas, must be developed before an accurate assessment of present/ future employment and skill level requirements can be made. Apparently this can only be accomplished by extensive on-site investigation since survey-requested information whether by questionnaire or telephone is either inconclusive or simply not forthcoming. This does not suggest that agencies or officials in charge are uncooperative....quite the contrary, all who were contacted were most anxious to assist in any way they could. They were confronted with fiscal restrictions which prevented them from developing the staff capability to examine in depth their particular area of concern. Where private industry was involved officials were reluctant to reveal manpower levels for fear of compromising their competitive position in the market place. (It was pointed out to this author that forthcoming legislation will require many so called trade secrets concerning manpower populations to become public information). Of no less importance was the fact that in several of the pollution control areas certain levels of the manpower populations may fluctuate by as much as fifty percent within a very few months. In other areas activities are so recent and limited in their development, and the level of training requisite to the field is so high that officials would make no predictions about what the future might bring, other than to suggest a minimal growth. In a few areas accurate though limited information was available, and reasonable estimates of growth and anticipated training needs could be made, which underscores the necessity for a good bit of field work to define more closely particular areas.

In general, the manpower situation in the environmental control areas examined by this study will depend on the degree to which existing and forthcoming state and federal mandates will be enforced. If a full-scale enforcement effort is mounted, then employment opportunities in all six areas should develop rapidly, particularly at the vocational/technical levels requiring up to two years of training. This effort will further require considerable cooperation between enforcement agencies and training agencies so that those entering training will be assured that his/her training program either prepares them for an existing position or anticipates job development in an area for which they will meet employment requirements.

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